THE IRON TRADE REVIEW

Volume XL | CLEVELAND, APRIL 11, 1907 | Number 15

LARGE ORDERS

ARE PLACED FOR STEEL MAKING PIG IRON

By Independent Interests.—Blast Furnaces Make Good Record in Spite of Flood.—Large Contracts for Structural Material.

Indications of a continuance of prosperity for an indefinite period are even more positive than they were last week. The slight uneasiness caused by the Wall street flurry has vanished and there is increased confidence in the soundness of conditions.

Buying of Bessemer. The determined stand taken some time ago and maintained for a number of weeks by large independent steel-making concerns that they would not buy pig iron for the last half of the year at more than $20 per ton furnace has been abandoned. Sales aggregating 250,000 tons at $21 furnace have been made. It is understood that, if independent interests had not entered the market, all available iron would have been taken by the United States Steel Corporation. There has been an active demand for prompt Bessemer and basic, but the supply is very limited. In foundry irons the week has been very quiet. Improved deliveries from the south have furnished some relief to districts depending upon southern iron, but the market is firm, with little, if any, change in prices.

Foreign Features. Reports from abroad present some interesting features in the British market. In the Middlesboro district, there has been an unprecedented demand for pig iron from both Germany and America and stocks in warrant yards have been heavily reduced. An unusual inquiry, which has been received with evidence of considerable satisfaction in the English market, is for cotton ties for the United States.

Structural Material. The demand for structural material shows decided improvement and sales of the principal interest in both the east and central west have been very large. Among the important orders taken were 15,000 tons for the Susquehanna bridge of the Baltimore & Ohio railroad, and some very heavy orders for bridges and buildings are pending. Of the 55,000 tons of structural steel ordered for the new plant at Gary, specifications have been filed for about 40,000 tons.

Slow Sheet Deliveries. The sheet mills are steadily falling farther behind in their deliveries. While at the beginning of the year the leading interest was making promises of from 15 to 16 weeks, it cannot now deliver short of 24 to 26 weeks. Never before were the independent mills so well supplied with orders as at the present time.

Pig Iron Production. Our monthly blast furnace statistics show a surprisingly good record of production in view of the flood conditions which compelled the banking of many furnaces for several days. The production for March was 2,186,709 tons, against 2,047,036 tons in February, but the daily production was smaller. Nearly every furnace in blast increased its production. A number of furnaces are nearly ready to blow in and the prospect is for large April production.

Rails For Chicago. The settlement of the long street railroad franchise controversy in Chicago has been quickly followed by the placing of an order for 20,000 tons of steel rails with the Lorain Steel Co., 10,000 each by the Chicago City Railway Co. and the Union Traction Co. Large orders for cars and other equipment are also expected.

HEAVY INQUIRY

For Pig Iron for Last Half—One Sale for Next Year—British Market.

(Special Telegram.)

New York, April 10.—Considerable business in spot foundry iron in the British market today opened at 55 shillings 4½ pence for No. 3 Middlesboro, a rise of a shilling and a half in a week. Hickman, Williams & Co. have chartered a cargo in that district.

A sales agency has closed for 500 tons of foundry iron for first quarter of next year at a very good price. In the Buffalo district four large interests are inquiring for total of 75,000 tons of foundry iron for last half.

MANY RAIL INQUIRIES.

New York, April 10.—Rail inquiries are numerous and include some heavy tonnages. Contracts of the week, however, have been light, totaling about 6,000 tons. Lots of 1,000 tons have been taken by the Chesapeake and Ohio and by the Tennessee railway.

NEW SHIPPING RULES.

In a decision rendered by the Ohio railroad commission on the complaint of shippers against the car service rules of Ohio railroads which reduced the free-time for unloading from 72 to 48 hours, a set of new rules is given which the railroads are ordered to use after May 15. A compromise was reached in regard to the time for unloading cars. On car loads of less than 60,000 pounds the limit remains at 48 hours. On larger cars, 72 hours is given. Consignees are given the alternative to operate under a system of averages. By this, credit is given for all cars unloaded within a day, and only full days are considered. These credits can be applied on cars detained beyond the time limit, but not more than seven days of such credit can be given. Shippers accepting this plan are excluded from taking advantage of the 72-hour rule on large cars. A charge of $1 is made for each day or a fraction of a day on the cars held beyond the free time. On cars placed before 9 a. m., free time is charged from noon of that day. On cars placed after 9 a. m., the charge does not commence until 7 a. m. the following day.

THE WEEK IN IRON CENTERS.

PITTSBURG.

Large Sales of Bessemer Pig Iron For Last Half of the Year.

(Special Telegram.)

Pittsburg, April 10.—W. P. Snyder & Co. have sold 100,000 tons of Bessemer pig iron to a large steel interest for last half delivery, part of this tonnage to be at $21 and part at the average monthly price. The Bessemer Association has sold 150,000 tons for last half to the Youngstown Sheet & Tube Co. at $21, of which 12,000 tons is to be furnished by the Cherry Valley Iron Co.

Office of THE IRON TRADE REVIEW,
521 Park Building, April 10

The past week has been but a repetition of the one before with the exception of a little greater activity in pig iron and the show of a more pronounced inclination on the part of steel making interests to contract for their last half requirements.

Except for the tonnages lost on account of the flood last month,—and these cannot be recuperated on account of the very heavy current demand for all classes of finished and semi-finished material,—the district has recovered from the spring rampage of the three rivers and all plants are again in operation. The setback incident to the floods and the flurries in the eastern stock market both undoubtedly had a great deal to do with new buying at the time, not so much in finished lines, as contracts for the requirements for the next six to seven months are already booked, but they had the effect of momentarily checking the buying of pig iron and semi-finished material for last half deliveries. Indications point at the present time to quite an extensive buying movement which, in the natural course of events and in view of business condition before the Wall street excitement, would have taken place about a month ago.

This movement is looked upon as the result of a careful review of conditions with a bearing on the future and an indication that the solution arrived at by large interests in manufacturing lines that there is nothing ahead before the fourth quarter, at least, to cause uneasiness and they are preparing for a continuation of the present prosperous situation.

Deliveries in all finished lines are getting worse weekly and one example of this condition in the case of the leading sheet and tin plate producer may be cited. On Jan. 1, the delivery promises were 15 to 16 weeks of blue annealed and galvanized sheets, and on April 1 the promises of delivery were 25 to 26 weeks, an unprecedented situation. An authority on this particular line is quoted as saying that up to 15 months ago there was an overproduction of sheet products in the United States and that eight weeks was about as far ahead as manufacturers of sheet products were usually booked. There has never been a time when the independent mills were so heavily booked and run so regularly, or for so long a time as during the era now on. Pipe and plate workers are in about the same shape.

There is a genuine scarcity of semi-finished material, so much so that, while no operations have been compelled to cease, nearly all of them have suffered to some extent and on account of inadequate supply of semi-finished steel have curtailed output to some degree.

Pig Iron.—The pig iron situation has strengthened more during the past week than for any single week for some time past, and this change is attributed to the buying movement put off three weeks or a month, early in March, on account of the uncertainties created in the minds of buyers by the financial flurries in the east. A complete recovery from flood conditions in the Pittsburg district also had considerable to do with the renewed strength shown. During the past week, the largest individual sale was 10,000 tons of Bessemer iron for June delivery to the Youngstown Sheet & Tube Co., at $22 valley furnace. Other sales reported were 1,500 tons of Bessemer, May and June delivery, at $23 valley, to the same interest that last week bought 9,000 tons of third quarter Bessemer at $21; 1,500 tons of basic, third quarter $21 valley; 2,000 tons of Bessemer, April to July, $22.50 valley. There is a marked scarcity in both grades of steel making iron as well as foundry, mill and forge iron for delivery before June. The large steel making interests, while they have not as yet done anything definite for last half, are expected to come in to the market within a short time for at least part of their requirements for the last half of the year. The inquiry for small lots of prompt Bessemer and basic iron have been brisk, but the majority of the merchant furnaces in the valley are so far sold up that they are in no position to quote for prompt or second quarter deliveries. The general understanding is that last half Bessemer prices will be fixed at $21 valley furnace. On prompt Bessemer $23 is quoted and $22.50 to $23 for deliveries during the remainder of the second quarter. Northern No. 2 foundry iron for prompt delivery is quoted $24.50 to $25 valley and one small lot has been sold during the past week at $25.25 valley for prompt delivery. For shipment during the remainder of the present quarter, $23.50 to $24 is quoted and $21.50 to $22 for deliveries during the last half with the opinion prevailing that last half prices will advance as that last half period approaches. Southern No. 2 foundry is quoted $22.50, Birmingham, for prompt shipment, and $18.50 to $19, Birmingham, for last half. Southern basic is quoted $20 Birmingham. In spite of the fact that large tonnages of southern iron have been shipped into the northern and western territory, the demand is still good and consumers apparently have no stocks for any considerable period ahead. One large independent interest in the Pittsburg district has announced that it will make no Bessemer iron during the last half of the year but confine itself to foundry and basic irons. The Steel Corporation, since it exercised its option on 10,000 tons of May Bessemer iron, has done nothing as far as buying in the open market is concerned for June, and nothing is expected from it until about May 1, as its plan has been to buy from month to month to cover shortages. The new furnaces of the Carrie group are expected to be blown in between May 1 and May 15. The Atlantic furnace of the Republic, which has been out for repairs for over two months, will be blown in next week. Contracts have been let for two furnaces for the Youngstown Sheet & Tube Co., at Youngstown. The new ore supply will begin to arrive at Lake Erie docks within the next two weeks and to several furnaces in the valley will be very welcome, as stock piles are pretty well cleaned up, although, as a general rule, furnaces got through the past winter in more comfortable shape than for several winters past. Pig iron for second quarter delivery is quoted as follows:

Bessemer, Valley	$22.50 to 23.00
Bessemer, Pittsburg	23.35 to 23.85
No. 1 Foundry, Pittsburg	24.85 to 25.10
No. 2 Foundry, Pittsburg	24.35 to 24.85
Gray Forge, Pittsburg	21.85 to 22.35
Basic, Valley	22.00 to 22.25
Basic, Pittsburg	22.85 to 23.10

Ferro - Manganese.—Ferro - manganese has been a very uncertain quan-

tity in this market for the past two or three weeks and prices have been erratic. There has been nothing doing in a large way and inquiries have been for small tonnages only. For spot shipment, we quote $74 Pittsburg and for last half delivery $68 to $69 Pittsburg. Imported 50 per cent ferro-silicon is quoted $110 Pittsburg; domestic 12 per cent, $36; 11 per cent, $35; 10 per cent, $34; with the lower grades imported ferro-silicon $1 higher.

Steel.—Quotations on semi-finished material are to a great extent nominal, on account of the scarcity of this class of steel. Soft Bessemer billets, 4 x 4 and larger, are quoted $29.50 to $30, maker's mill in the Pittsburg district, but it is doubtful if they could be secured at the lower figure except in special instances such as an overrun of odd sizes or surplus over finishing consumption at some of the smaller producers. Open-hearth billets are quoted $31 to $31.50 and sheet bars, while the official adjustment for the month figured out $30, have been sold at $31, Pittsburg.

Wire and Wire Nails.—The enormous demand for wire products and especialy barbed, plain and welded fence, and nails, continues without interruption. The shortage of proper cars has to some small extent delayed shipments, but this has not been a very serious feature. Prices are unchanged as follows:

Wire nails, jobbers' carload lots, $2; retailers' carload lots, $2.05; less than carloads, $2.10; painted barb wire, $2.15, for jobbers in carloads; retailers in carloads, $2.20; and less than carload, $2.30 with 30c for galvanizing; plain wire, $1.85 for jobbers and $1.90 by carload.

Merchant Bars.—There has been no change in the steel bar situation and specifications are as heavy as they have been in the past, but the new business has been light, this on account of the disinclination of the part of producers to take on further obligations for deliveries ahead. The implement makers have not approached the steel bar producers in regard to concessions and the opinion now prevails that they will not do so, being fully satisfied that they will be compelled to pay the full market price for their requirements for the coming year. Bar iron, while it has been moving slowly, is very firm as to price and we quote 1.80c base, Pittsburg, for delivery in this district and 1.65c base, Pittsburg, plus freight to point of delivery for western shipment. Official quotations are as follows:

Common iron bars, 1.80c Pittsburg in carload lots and over; 1.85c in less than carloads; Bessemer steel bars, 1.60c, net; plow and cultivator, 1.60c, net; channels, angles, zees, tees, under three inches, 1.70c, all f. o. b. Pittsburg. The following differentials are maintained on steel: Less than 2,000 pounds, 0.10c advance; less than 1,000 pounds of a size, 0.30c advance. Cold rolled and ground shafting, 50 per cent off in carload lots, and 5 per cent off in less than carloads, delivered in base territory; open-hearth spring steel, 2.25c to 2.50c; sleigh shoe flats, 1.60c to 1.65c; smooth finished machinery steel, 1.90c to 2c; toe calk, 2.10c to 2.15c. The price of planished and machine straightened tire is 1.80c, base, half tire extras. Iron finished tire up to 1½ inch and over to be sold on regular bar basis of 1.60c base, half extras, steel card.

Muck Bar.—As far as can be learned there has been no movement in muck bar during the past week or for several weeks past except on old contracts and we quote nominally $37.50 to $38 for all pig metal bars, $36.75 for scrap bars.

Sheets.—The past week has been no exception in regard to specifications received by sheet producers and, as has been the case for each week of the past several months since last October, specifications have been greatly in excess of the total capacity. The best possible deliveries on blue annealed and galvanized sheets is four to five months and some idea of the specifications in excess of shipments may be gained from the statement that on Jan. 1 the leading interest was making promises from 15 to 16 weeks, and since that time specifications have increased over shipments at the rate of ten days' capacity each month. During the middle of March for a week, 52 per cent of the total capacity of the leading interest was out on account of the flood or conditions arising from it, and this led to greater delay in shipments. Additional sheet capacity at Vandergrift and two other plants is expected to be ready May 1. This will help to some extent, if the supply of semi-finished material is equal to requirements. There has been no change in prices and we quote as follows:

Black steel sheets one pass, cold rolled; Nos. 11-12, 2.20c; Nos. 13-14, 2.25c; Nos. 15-16, 2.30c; Nos. 17-21, 2.35c; Nos. 22-24, 2.40c; Nos. 25-26, 2.45c; No. 27, 2.50c; No. 28, 2.60c; No. 29, 2.75c; No. 30, 2.85c; galvanized, Nos. 10-11, 2.65c; Nos. 12-14, 2.75c; Nos. 15-16, 2.85c; Nos. 17-21, 3.00c; Nos. 22-24, 3.15c; Nos. 25-26, 3.35c; No. 27, 3.55c; No. 28, 3.75c; No. 29, 4.00c; No. 30, 4.25c. Corrugated roofing, $1.85 per square for No. 28 painted, 2½-inch corrugation, and $3.25 per square No. 28.

Plates.—The situation as far as steel plates is concerned is stronger now than it has been at any time since the heavy bookings which began last September. During the past week alone, the actual specifications amounted to 30,000 tons more than shipments during the same period. The pipe, bridge and car building interests are the leading consumers and their demands are so heavy that the available supply is being apportioned among them. There are several big riveted pipe deals pending, but at present they are shrouded by mystery and on account of the condition of the money market, some difficulty is being experienced in floating the necessary bonds. The steel corporation has out active inquiries for 500 steel box cars to carry cement; 400 of these for the cement interests of the Illinois Steel Co. and 100 for a new plant being erected at Universal, Pa. Further information in regard to the inquiry for 125,000 tons of steel plates for California is to the effect that a line 132 miles long, about one-half of this 10-foot steel riveted pipe is to be laid for the Los Angeles water supply, the bending and riveting to be done on the grounds instead of shipping the pipe from Pittsburg and Chicago districts. Estimates are also being asked on cement pipe for this work. Prices are unchanged and we quote nominally as follows:

Tank plate, ¼-inch thick, 6½ to 100 inches, 1.70c f. o. b. mill Pittsburg. Light plate schedule, No. 10, 1.80c; Nos. 11-12, 1.85c; Nos. 13-14, 1.90c; Nos. 15-16, 2c; extras on the regular plate schedule are as follows per 100 pounds: Boiler and flange steel plates, 0.10c; A. B. M. A. and ordinary firebox steel plates, 0.20c; still bottom steel, 0.30c; marine steel 0.40c; locomotive firebox steel, 0.50c; all sketches, excepting straight taper plates varying not more than four inches in width at ends, narrowest end not being less than 30 inches, 0.10c; circles, 0.20c. Plates in width over 100 inches up to 110 inches, 0.05c; over 110 inches up to 115 inches, 0.10c; over 115 inches up to 120 inches, 0.15c; over 120 inches up to 125 inches, 0.25c; over 125 inches up to 130 inches, 0.50c; over 130 inches, 1.00c; gages under ¼-inch to and including 3-16-inch plates on thin edges, 0.10c; under 3-16 to and including No. 8, 0.15c; under No. 8 and including No. 9, 0.25c. Five cents extra for less than carloads. Terms, net cash in 30 days.

Tin Plate.—As stated in this report last week, March specifications were the heaviest of any March in the history of the business. Considerable uncertainty is felt at the present time in regard to last half deliveries, this on account of reports from California to the effect that frost has ruined two-thirds

of the early canning crops, but this is probably greatly exaggerated, as is always the case at this time of the year. Current specifications, while not as heavy as those for black, galvanized and blue annealed sheets, are in fair volume. Consumers apparently are in no hurry to make contracts for future delivery demands. On business for third quarter delivery we quote as follows:

Coke tin plate, 100-pound basis, 14 x 20, $3.90 f. o. b. mill, Pittsburg district. Terms, 30 days, less two per cent for cash in ten days.

Hoops and Bands.—This market has been moving along in a quiet way with no particular interest being shown except that small contracts have been renewed as they expired and specifications on such contracts are as heavy as they previously have been. We continue to quote:

Hoops in carload lots, 2c; in less than carload lots, 2.10c; bands, 1.60c base half extras as per standard steel.

Rails and Track Material.—The tonnage closed by the leading interest for standard sections during the past week was slightly under 10,000 tons with an inquiry of about 30,000 tons, upon which no action was taken. A fair tonnage of light rails was also placed on the books, but specifications on light sections have not been as heavy as the mills would like to see. There has been no change in prices and we continue to quote:

Fifty-pound and heavier, 500-ton lots and over, $28; carloads and less than 500 tons, $30; less than carload lots, $32; 8-pound, $40; 12-pound, $36 to $37; 16-pound, $35 to $36; 20-pound, $34 to $35; 25 to 45-pound, $33 to $34; angle splice bars for standard sections, $1.65; spikes for forward deliveries, $2.50.

Coke.—The past week has seen a further softening in prices, in both foundry and furnace coke for prompt shipment and while conditions have not been as good as they were a month ago, the market is stronger than would be expected with gradually decreasing prices noted during the past month. The production in the region has been good but nothing unusual, in spite of the fact that many new operations put under way last fall and during the winter are now fired up and producing coke. Furnace coke is quoted $2.80 to $2.85 at the ovens and foundry coke for either spot shipment or delivery before July 1, $3.40 to $3.50 while $3.50 is still quoted for last half shipment.

Merchant Pipe.—There has been no decrease in the volume of business taken on by the pipe interests since the withdrawal of official prices and delivery promises now extend well over six months under the most favorable conditions. Jobbers are placing their orders as freely as before notwithstanding the fact that they do not know the price to be paid on the same and will not know until just prior to June 1. No delivery promises whatever are being made on new business from jobbers. The nominal jobbers' discount is 74 and five with consumers' one point higher. For merchant pipe out of stocks 71 and five off has been paid. On wrought iron pipe the nominal extreme discount on base sizes is 68 and five off. We quote the following nominal prices to consumers, card allowing one point higher discount to jobbers:

	—Steel—	
	black.	galv.
⅛ to ¼ inch	65	49
⅜ inch	67	53
½ inch	69	57
¾ to 6 inches	73	63
7 to 12 inches	68	53
EXTRA STRONG PLAIN ENDS.		
⅛ to ⅜ inch	58	46
½ to 4 inches	65	53
4½ to 8 inches	61	49
Double extra strong plain ends, ½ to 8 inches	54	43

Old Material.—This market continues dull with but very little scrap offered in large tonnages. Consumers are holding aloof and displaying no activity in the direction of buying material, while from a selling standpoint, prices are undeniably weaker, making a mean trading market. For prompt shipment, delivery in the Pittsburg district, we quote as follows:

Heavy melting scrap, $18 to $18.25; re-rolling rails, $19 to $19.50; bundled sheet scrap, $16.50 to $16.75; iron axles, $30.50 to $31; old iron rails $23 to $23.50; No. 1 wrought scrap, $19 to $19.25; old car wheels, $24.50 to $25; low phosphorus scrap, $22.50 to $23; machine shop turnings, $15.50 to $16; axle turnings, $16.50 to $17; cast borings, $13.25 to $13.75; No. 1 cast scrap, $20.50 to $21.

CHICAGO.

Heavy Demand for Structural Shapes. —Pig Iron Quiet But Firm.

Office of THE IRON TRADE REVIEW, 1362 Monadnock Block, April 9

With the passage of March, a marked revival in the demand for structural steel has developed. Stimulated by an early spring and the rapid filling up of mills, and reassured of the stability of financial conditions, hesitancy has given way to haste in closing contracts. Last week, the American Bridge Co. secured orders for an aggregate of nearly 125,000 tons of material, which was the largest week's business in its history. Local fabricators have been asked to rush figures on a number of pending projects, and there is every indication that near to 50,000 tons will be closed within a few weeks. That this enormous consumption of finished material extends to other lines is evidenced by the specifications on the books of the Illinois Steel Co., amounting to 495,000 tons, as against orders aggregating 1,250,000 tons. This tonnage is very evenly distributed among the company's products and represents the highest level of orders and specifications in hand ever reached. The strength of the market, so far as finished material is concerned, cannot be exaggerated. From local mills, four to six months is the best delivery obtainable on plates; twenty to twenty-six weeks is required on sheets; two months on structural shapes; three months on light rails; six months on heavy rails; two to four months on steel bars; six weeks to two months on bar iron, and three months on merchant pipe. Earlier shipments can be secured on some of these products from other makers, but only on the payment of premiums.

There is no apparent change in the pig iron situation, other than a strengthening of prices. Eighteen-dollar iron for last half has been wholly withdrawn, and the absolute minimum for that delivery is $18.50 Birmingham for No. 2 foundry. It is difficult to get a price on northern No. 2 for second half, but the last quotation was $23.50 Chicago. Cast iron pipe has shared in the active buying movement of the last ten days, at least 15,000 tons having been closed in this period by the leading producer. There is no cessation in the movement of wire products, manufacturers having found it necessary to pro rate their output in order to satisfy the most pressing needs.

As one result of the settlement of the street railway franchise question in Chicago, 20,000 tons of standard section rails have been ordered from the Lorain Steel Co., 10,000 by the Chicago City railway, and 10,000 by the Union Traction Co., deliveries to begin at an early date.

Pig Iron.—Very little interest is shown in pig iron. From the standpoint of sales, the last ten days were the quietest in several months. Nevertheless, the market has not lost one iota of its strength. Conditions seem to be firmer, if anything. No more short sales for the last half are being made at $18 Birmingham; the minimum today for southern No. 2 is $18.50. Northern irons for the last half have also taken on increased strength, although there is no current demand for same. The quotation of $23.50 Chicago for No. 2 foundry has been withdrawn, and each inquiry for this shipment henceforth must stand on its own merits. Demand for spot iron has declined to a point where it has almost ceased to exist. Shipments from southern furnaces have followed one another very rapidly since the warm weather set in, and melters now have ample supplies in their yards. The delivery of northern iron, however, is not so

regular, and because of the suspension of so many local furnaces it is unlikely that the delinquency will be overtaken in the next few months. Relief from other producing centers is problematical because of the pressing demands that have to be met in the territories contiguous to same. We have advanced our southern prices 50 cents a ton for the last half, and quote as follows:

Lake Superior charcoal	$25.50 to 26.50
Northern Foundry No. 1	24.00 to 24.50
Northern Foundry No. 2	23.50 to 24.00
Northern Foundry No. 3	23.00 to 23.50
Northern Scotch Foundry	24.00 to 24.50
Ohio Strong Softeners No. 1	23.30 to 23.80
Ohio Strong Softeners No. 2	22.80 to 23.30
Southern Foundry No. 1	23.35 to 23.85
Southern Foundry No. 2	22.85 to 23.35
Southern Foundry No. 3	22.35 to 22.85
Southern Foundry No. 4	21.85 to 22.35
Southern No. 1 Soft	23.35 to 23.85
Southern No. 2 Soft	22.85 to 23.35
Southern Gray Forge	21.35 to 21.85
Southern Mottled	20.85 to 21.35
Southern Silveries, 4 per cent to 6 per cent Silicon	23.85 to 24.85
Jackson Co. Silveries, 8 to 10 per cent Silicon	30.30 to 32.30
Malleable Bessemer	23.50 to 24.00

Billets and Rods.—Extreme strength is noted in both materials. New tonnage is hard to place with mills and early deliveries can be secured only by payment of stiff prices. Two transactions for prompt shipments in the local market in the week under review were closed on the basis of $39 Chicago for forging billets, and $40 Chicago for wire rods. On orders for forward delivery the market is slightly lower, current quotations being represented in a range from $36 to $38 Chicago for forging billets; $36 Pittsburg for chain and Bessemer rods, and $37 Pittsburg for open-hearth rods.

Iron and Steel Bars.—While specifications for steel bars against current contracts are active and heavy, the volume of new business for forward delivery is not quite up to the expectations of makers. Some small contracts for the second half have been taken, the aggregate of which forms a respectable tonnage, but none of the big consumers have yet shown a disposition to contract for future wants. All the mills have sufficient tonnage on their books to carry them well forward into the fall, and this procrastination is not causing any uneasiness at the present time. Demand for iron bars is good and western mills are running to fullest capacity. Prices are not so firmly maintained as formerly, however, some shading of the 1.65c Pittsburg schedule being reported. We quote as follows:

Soft steel bars and bands, 1.76½c, half extras; soft steel angles, less than 3 x 3, 1.86½c; hoops, 2.16½c base, full extras. We quote bar iron from stock, 2.25c, full extras; soft steel rounds and squares, 3 inches and larger, $2 per 100 pounds base; flats, 2 inches to 4 inches by ⅛ inch and larger, $2 per 100 pounds base; 4½ inches x 5 inches and 6 inches x 5-16 inch and thicker, $2 per 100 pounds base; all ovals, half rounds, $2 per 100 pounds base; steel bands, $2, half extras; soft steel hoops, 2.40c to 2.50c full extras. Other sizes not mentioned above, $2 per 100 pounds base plus half extras.

Plates.—The delay in starting the new universal plate mill of the Illinois Steel Co. is causing more or less distress to customers that had placed orders against its output. It was originally intended to have this mill in operation by the first of the year, but May 15 to June 1 is the date now set. Specifications and new tonnage for sheared plates show no signs of declining. Local makers are literally snowed under with orders, and the best delivery on new business is four months from date of placing order. Jobbers are holding firmly to listed prices, having all the business they can take care of. We quote as follows:

Plates ¼ inch and thicker 6⅛ to 100 inches wide, either universal or sheared, 1.70c Pittsburg base. For extras see Pittsburg report. Freight rate to Chicago, 16½c per 100 pounds. Jobbers' prices for shipment from local stocks are as follows: Tank steel ¼ inch and heavier up to 72 inches wide, 2.20c; 3-16 inch up to and including 60 inches wide, 2.30c; 3-16 inch 72 inches wide, 2.55c; No. 8 up to 60 inches wide, 2.35c. Flange steel, 25c extra; heads, 25c extra.

Sheets.—The demand for black and galvanized sheets shows no abatement. Orders are accumulating faster than mills can turn out the material, and deliveries necessarily are becoming further delayed. Twenty-six weeks is the best time that can be done on galvanized, while twenty weeks are required for the delivery of black sheets. This condition of affairs is deflecting an increasing volume of business to jobbers, who are constantly hard pressed to keep their stocks replenished. Prices are firm at the levels listed below:

Black sheets Nos. 8, 9 and 10, 1.90c Pittsburg; No. 28 gage, 2.60c Pittsburg. Galvanized sheets No. 28 gage, 3.75c Pittsburg. Freight to Chicago 16½c per 100 pounds. Jobbers' prices on less than carload lots from store are as follows: No. 10, 2.25c to 2.30c; No. 12, 2.30c to 2.35c; No. 14, 2.35c to 2.40c; No. 16, 2.45c to 2.50c; Nos. 18-20, 2.70c to 2.80c; Nos. 22-24, 2.75c to 2.85c; No. 26, 2.80c to 2.90c; No. 27, 2.85c to 2.95c; No. 28, 2.95c to 3.05c; No. 30, 3.35c. Galvanized sheets, Nos. 10 to 20, 3.40c to 3.45c; Nos. 22 and 24, 3.55c to 3.60c; No. 26, 3.75c to 3.80c; No. 27, 3.95c to 4c; No. 28, 4.15c to 4.20c; No. 30, 5.35c to 5.40c.

Structural Steel.—Building contracts aggregating considerably over 100,000 tons of steel were closed last week through the various branch offices of the American Bridge Co. This is by far the greatest week's business transacted by this company in its history, and is typical of the great stress under which all iron and steel interests are working. Figures are now being made by local fabricators on the new shops of the Frisco System at Chaffee, Mo., the steel requirements of which amount to 7,000 tons; on the extensions to the shop of the Pullman Co., 9,000 tons, and on the Corn Exchange bank, Chicago, 4,500 tons. A large amount of western mining work is also being figured upon. The contract for fabricating the 1,200 tons of structural shapes required in the Earle building, Los Angeles, was let to the Llewellyn Iron Works, of that city. The only railroad cancellation reported in this market involves the Pullman Co. Verification cannot be obtained, but the rumor is that of an order for 6,000 cars received by the local interest some months ago, one-sixth was cancelled, and construction of the remainder was held up pending further instructions. Local mills and jobbers report that the movement of structural shapes from stock shows a continual growth. Prices are without change as follows:

Beams and channels, 3 to 15 inches inclusive, 1.70c Pittsburg. For extras see Pittsburg report. Freight rate from that city to Chicago is 16½c per 100 pounds. Quotations from stores are as follows:

All angles, three inches and larger, including six inches, $2.05 to $2.10 per 100 pounds; angles over six inches, $2.15 per 100 pounds base, beams, three inches to 15 inches, inclusive, $2.05 to $2.10 per 100 pounds base; channels, three inches and larger, $2.05 per 100 pounds base. Less than carload lots are $1 a ton higher than foregoing prices.

Rails and Track Supplies.—With the local mill practically out of the market for the balance of 1907, new tonnage is necessarily of a restricted nature. Inquiries are plentiful, however, and a large volume of business could be taken if the requisite deliveries could be made. This is true also of light rails and track supplies, the demand for both being very active. We quote as follows:

Bessemer rails, $28 to $30; less than 500-ton lots, $32; open-hearth rails, $29; light rails, Bessemer, 30 to 45-

pound sections, $35; 25-pound, $36; 20-pound, $37; 16-pound, $38; 12-pound, $39, and lighter sections down to 8-pound, $45.50, all f. o. b. mill. Track supplies vary in price according to quantity and delivery. On orders accompanying rail contracts for future delivery, we quote angle bars, 1.65c; spikes, 2.35c; bolts with square nuts, 2.65c; with hexagon nuts, 2.80c. For carload lots or less, for prompt shipment, the following prices are asked: Angle bars, 2.25c to 2.75c; spikes, 2.60c to 2.70c; bolts with square nuts, 2.85c; with hexagon nuts, 3c.

Merchant Steel. — Practically no new tonnage is being placed, but specifications are coming in freely. Mill deliveries are slow. Prices are without change as follows:

Planished or smooth finished tire steel, 1.96½c; iron finish, up to 1½ x ½ inch, 1.91½c base; iron finish, 1½ x ½ inch and larger, 1.76½c base; channels for solid rubber tires, ¾ to 1 inch, 2.26½c, and 1⅛ inch and larger, 2.16½c; smooth finished machinery steel, 2.16½c; flat sleigh shoe, 1.81½c; concave and convex sleigh shoe, 2.06½c; cutter shoe, 2.35c; toe calk steel, 2.31½c; railway spring, 1.96½c; crucible tool steel, 6½c to 8c, with higher prices asked on special grades. Shafting is very strong. Quotations are without change at 50 per cent off in car lots and 45 per cent in less than car lots in base territory.

Cast Iron Pipe.—A verbal order has been given the United States Cast Iron Pipe & Foundry Co. by the city of Chicago for that portion of its 12,000-ton inquiry which it has decided to contract for at the present time. What sizes will be desired, or the exact tonnage, is not yet known, but it is assumed that about 6,000 tons will constitute the first section. The same interest has also received an order from Salt Lake City for the large sizes of pipe included in the bid for 5,000 tons. This amounts to 2,500 tons. The smaller sections have not yet been decided upon. In addition to these two contracts, an aggregate of 5,000 tons has been closed with several other cities. Portland, Ore., is now figuring upon 2,600 tons, and several other medium sized wants are also pending. Prices are firm but without change. We quote four-inch water pipe, $38.60; six to 12-inch inclusive, $37.60; 16-inch and upward, $36.60; gas pipe, $1 a ton higher.

Merchant Pipe and Boiler Tubes.—Up-to-date, little progress has been made by the National Tube Co. in overtaking its delinquent deliveries owing to the delays incident to the floods, scarcity of crude steel and the difficulty of getting cars. The congestion is much greater on the smaller sizes of lap and butt welded pipe; on the large sizes very reasonable shipments can be made. Some little business has been taken for delivery in the second half, but only on condition of mill's convenience and at prices to be determined later. Independent makers and jobbers are getting all the business they can comfortably handle, and deliveries from these are becoming more remote. The following prices are those of a large independent maker, and are on the basis of Pittsburg delivery:

Random lengths with thread couplings, ⅛ and ¼ inch, 65 per cent discount off for black and 49 per cent off for galvanized; ¾ inch to 6 inches, 73 per cent off for black and 63 per cent off for galvanized; 7 to 12 inches are quoted at 68 and 53, respectively. Extra strong plain ends are held at 58 off for black and 46 off for galvanized, in sizes from ⅛ to ⅜ inches, and at 6 and 49 respectively for 4½ to 8 inches.

Chicago jobbers are quoting 70 off for black steel pipe, ¾ to 6 inch, and iron pipe at four to five points higher. Tubes are unchanged at 60 off for steel, and 47½ off for iron and seamless.

Wire Products.—The hope that mills will succeed in wiping off the delinquent tonnage from their books this season is very problematical. On all lines, deliveries are slow and far behind contract requirements. In some materials, such as wire cloth and poultry netting, the output of the leading producer is pro rated among the most pressing customers; while for nails, smooth wire and barbed fence, an extra car or an earlier shipment is secured only by insistent solicitation. An advance of five cents per 100 square feet in wire cloth became effective a few days ago, making the price $1.20 to jobbers, and $1.35 to retailers, base territory. Other prices are without change, as follows:

Wire nails, $2.15; painted barb wire, $2.30; galvanized barbed wire, $2.60; smooth annealed wire, $2.30; polished staples, $2.55. Carload lots to retailers, five cents higher; less than carload lots, 15 cents higher.

Coke.—Considerable contracting is being done for forward requirements. There is a fair demand for spot and nearby deliveries, but the greatly improved shipments from Connellsville ovens has decreased this tonnage. Prices for foundry coke are unchanged at $3.50 to $3.60 Connellsville ovens for forward deliveries, and $3.60 ovens for second quarter wants. Solvay coke for quick shipment is held at $6.75 Chicago, but on extended or season contracts this price can be shaded 25 cents a ton.

Old Material.—Ten thousand tons of scrap are offered in five new railroad lists out this week. Country dealers are also reported to be accumulating material rapidly and as being anxious to transfer some of it into cash. This free offering of material should portend a decline in values, but the contrary is true, especially for spot shipment. Since the mill purchases announced last week, another iron and steel maker has been asking for quotations on old material, and is reported to have bought a considerable tonnage. Rerolling rails, old iron rails, No. 1 and 2 wrought; boiler punchings and cast borings each have been marked up. For forward deliveries of scrap, speculation by local dealers is decidedly bearish in nature. The railroad lists pending are as follows: Baltimore & Ohio, 5,500 tons; C., R. I. & P., 1,800 tons; C., M. & St. P., 1,650 tons; C. & E. I., 600 tons, and Wisconsin Central, 500 tons. We have revised our prices, and quote as follows for immediate shipment. Gross tons are given in the first paragraph:

Old Steel Rails (3 feet and over)	$19.00 to 19.50
Old Steel Rails (less than 3 feet)	17.00 to 17.50
Old Car Wheels	25.00 to 25.25
Old Iron Rails	24.50 to 25.00
Light Section Relayers, 45 lbs. and under, subject to inspection	30.00 to 32.00
Relaying Rails, subject to inspection	31.00 to 31.50
Frogs, Switches and Guards	16.50 to 17.00
Heavy Melting Steel	16.00 to 16.50
Mixed Country Steel	12.50 to 13.00

We quote net tons as follows:

No. 1 R. R. Wrought	$15.50 to 15.75
No. 2 R. R. Wrought	14.50 to 14.75
Shafting	17.00 to 17.50
Dealers Forge No. 1	12.00 to 12.50
Wrought Pipe and Flues	12.00 to 12.50
No. 1 Cast, 150 lbs. and less	19.00 to 20.00
No. 1 Mill	10.00 to 10.50
Mixed Busheling (No. 1 & No. 2)	11.00 to 11.50
Country Sheet	8.50 to 9.00
No. 1 Boilers Cut	11.50 to 12.00
Boiler Punchings	15.00 to 15.50
Cast Borings	9.50 to 10.00
Mixed Borings, etc	9.00 to 9.50
Machine Shop Turnings	11.50 to 12.00
Railroad Malleable	16.00 to 16.50
Agricultural Malleable	15.50 to 16.00
Stove Plate and Light Cast Scrap	15.00 to 15.50
Old Iron Splice Bars	19.50 to 20.00

CLEVELAND.

Heavy Transactions in Bessemer Pig Closed.—Jobbers Are Busy.

Office of THE IRON TRADE REVIEW,
Browning Building, April 9

Iron Ore.—The two vessels which left Lake Erie ports April 1, bound for Duluth, have not reached their destination on account of the heavy ice, and there is a general disposition on the part of vessel interests not to send out their boats until it becomes

known that there is no danger from ice. At Escanaba, the first ore of the season was dumped on the ore docks April 4, and some ore has been delivered at Duluth, but the outlook is that there will not be much activity at upper lake ports before May 1. The movement of ore from docks to furnace yards is heavy, but the supply of cars is not up to the demand. Agreements with several unions of lake employes are yet to be made. No fear of disagreement is, however, entertained.

Pig Iron.—Heavy tonnages of steel making iron at $21 valley for last half delivery, have been sold to independent steel interests. The determination expressed some weeks ago, and for a time adhered to, not to pay more than $20 for Bessemer pig iron has been abandoned. Except for spot iron for which the demand has been active, foundry grades have been quiet during the week. The usual quotation for foundry grades is $25 Cleveland for spot iron, and higher prices have been paid in some cases. We quote, f. o. b. Cleveland for last half delivery, as follows:

Bessemer	$ 21.85
No. 1 Foundry	22.50
No. 2 Foundry	22.00
No. 3 Foundry	21.50
No. 2 Southern	22.85
Gray Forge	20.00 to 20.50

Coke.—The market continues quiet and is without appreciable change as to prices. For the remainder of the year, we quote furnace coke at $2.90 at the ovens and foundry at $3.50 to $3.60.

Finished Material.—Jobbers report great activity in all lines. Specifications are being received at the mills in tremendous volume, and there is also a large amount of new business, although in some cases the fact that deliveries cannot be given until from four to six months causes some hesitancy in placing further orders. Many consumers are urging deliveries at far future dates with as much energy as they usually do for the immediate future. The plate situation is exceedingly strong in this locality, but one large eastern Pennsylvania interest reports that it has caught up on deliveries of universal plates. Cleveland companies are asking two cents, and find no difficulty in obtaining that price, which is $6 per ton above the so-called official quotation. Deliveries on plates are now from 24 to 26 weeks. Forging billets, which have been selling at $38 to $40 Johnstown, are now obtainable at from $36 to $37. The demand for structural shapes is excellent, but many buyers insist upon prompt delivery, giving the orders to the mill which makes the best promise as to delivery.

Old Material.—A lower market generally on all grades is believed to be imminent. Some local dealers acting on advices from other cities have quit buying at present quotations. Offerings have been freer in the past week, and this is particularly true of agricultural scrap. Busheling has been off somewhat, but up to the late indications of decline, other grades had been holding steady. The Pullman Co. and the Pennsylvania lines west have closed on lots of 1,000 and 3,000 tons respectively, while the B. & O., with an exceptionally large list, and the Pennsylvania lines west, the Norfolk & Western and the southern railroads will close this week. We have revised our quotations, and quote, f. o. b. Cleveland, gross tons, as follows:

Old iron rails	$25.00 to 26.00
Old steel rails (re-rolling)	18.00 to 19.00
Old steel rails (under 6 feet)	18.50 to 19.50
Old car wheels	23.00 to 23.50
Steel boiler plate	14.00 to 14.50
Steel axles	21.50 to 22.50
Malleable iron (railroad)	18.50 to 19.00
Malleable iron (agricultural)	16.50 to 17.00
Heavy steel	17.00 to 17.50
Country mixed steel	14.50 to 15.50
Low phosphorus	22.50 to 23.50

We quote net tons as follows:

No. 1 R. R. wrought	$16.50 to 17.50
No. 1 busheling	13.50 to 14.00
No. 1 machine cast	18.00 to 19.00
Iron axles	25.50 to 26.00
Axle turnings	14.00 to 14.50
Wrought turnings (free from cast)	12.75 to 13.25
Grate bars	14.00 to 15.00
Pipes and flues	13.50 to 14.00
Tank iron	12.00 to 13.00
Hoop and band iron	8.50 to 9.00
Sheet iron	7.50 to 8.50
Wrought drillings	13.00 to 13.50
Stove plate	15.00 to 15.50
Cast borings	10.75 to 11.25

PHILADELPHIA.

Increased Activity of Railroads in Buying.—Chinese Iron Purchased.

April 9.

Pig Iron.—No signs of any weakening in prices have appeared in this market, which remains substantially unchanged from last week. Second quarter iron commands more or less fancy prices, and yet, scarce as it is, it is known that there are still a number of consumers who have not yet covered their requirements for May and June. So far as can be ascertained, these belated buyers are trusting to some sort of miracle to reduce prices in the next three months, and, if that fails, will place their reliance on English iron and the stray carloads that can be picked up from domestic furnaces. Some will enjoy the novelty of using Chinese iron, regarding whose importation some interesting facts have been learned. The amount secured by a large pig iron house is 5,000 tons, which is said to have been made to the order of the Japanese government, but for some unknown reason was not taken. It is to be shipped from Shanghai and is guaranteed to arrive in New York in two cargoes, either by way of the Suez canal or around the Horn, before June 30. The iron is basic, known as Chinese chill cast, and gives the following chemical analysis: Silicon, averaging 0.75, maximum 0.85; phosphorus, average 0.20, maximum 0.35; sulphur, average 0.02, maximum 0.04; manganese, average 2.50 to 2.75; maximum 3.00. A large amount of business is being placed for the third quarter, but there is still a disposition among both producers and consumers to fight shy of the last quarter except in orders covering the entire last half. Prices for that period, to which a premium of from 50 cents to $1.50 must be added for second quarter delivery, may be quoted at the figures given last week, as follows:

No. 1X Foundry	$25.00 to 25.50
No. 2X Foundry	23.50 to 24.50
No. 2 Plain	23.00 to 23.50
Standard Gray Forge	22.25 to 22.75
Basic	23.75 to 24.50
Low Phosphorus	27.00 to 27.50

New Material.—Recent events indicate there is to be little cessation, if any, in railroad activity and that the mills may confidently look for a large business from this source for many months. Local indications of this kind are the Baltimore & Ohio railroad's award last week of a contract to the American Bridge Co. for a new $2,000,000 bridge across the Susquehanna river, to replace the present single-track structure; the announced determination of the same company to build a $9,000,000 cut-off around Baltimore, and the preparation of the Pennsylvania railroad to continue the construction of its low-grade freight line to Philadelphia. The improvement in the Wall street situation is reflected in a more cheerful feeling in the finished product market, and a very large amount of new business has been placed during the past week. Prices remain unchanged from last week, as follows:

Beams, channels and angles, according to specifications, 1.83½c to 2c; refined iron bars, 1.89½c to 1.93½c; steel bars, 1.83½c to 1.88½c; plates, 2.13½c to 2.18½c.

Old Material.—Rather free offerings of scrap have had the effect of reducing prices in several lines, the loss in some instances reaching $1 a ton. The mills still refrain from large purchases, and the whole market is quiet. Prices may be quoted as follows:

Old steel rails	$19.00 to 19.50
No. 1 steel scrap	18.25 to 18.75
Old steel axles	22.00 to 22.50

Old iron axles	29.00 to 30.00
Old iron rails	25.50 to 26.50
Old car wheels	22.50 to 23.50
Choice scrap R. R. No. 1 wrought	19.75 to 20.25
No. 1 yard scrap	18.00 to 18.50
Machinery Scrap	22.00 to 22.50
Low phosphorus scrap	22.50 to 23.00
Wrought iron pipe	16.50 to 17.00
No. 1 forge fire scrap	16.75 to 17.25
No. 2 forge fire scrap, ordinary	11.50 to 12.00
Wrought turnings	16.50 to 17.00
Axle turnings, heavy	17.25 to 17.75
Cast borings	15.50 to 16.00
Stove plates	17.00 to 17.50

NEW YORK.

Important Structural Contracts.—Pig Iron Market Quiet.

Office of THE IRON TRADE REVIEW.
Room 1315, No. 150 Nassau St., April 9.

Pig Iron.—Following the active selling movement of a fortnight ago, the local market has become more quiet and current inquiry is practically confined to scattered lots for immediate or early shipment. As furnaces tributary to this district are generally sold well into the future and have little spot iron to offer, more generous recourse is being had to foreign iron and a considerable volume of business is resulting. About 8,000 tons of British iron is due at Philadelphia this week. Reports from abroad are that the Middlesboro district is experiencing an unprecedented demand for iron for shipment to both Germany and America. In one week the leading warrant yard in that district reduced its stock practically 10,000 tons and up to March 27 the reduction for the year aggregated 67,000 tons. These enormous inroads into the only stock of iron in Great Britain would have been even larger had it not been for the limited dock facilities, by reason of which vessels loading for export have suffered heavy delays, and it is stated that the tonnage now under charter is sufficient in itself to keep the docks busy for at least two months. Prices at tidewater vary considerably, but the market is apparently about $20.50, exclusive of freight charges to destination, with occasional sales fifty cents higher and a few reported at fifty cents below that figure. Domestic foundry for spot delivery sold during the week at $24.50, delivered, for No. 2 X. For last half, we quote tidewater prices as follows:

Northern Foundry No. 1	$24.00 to 24.50
No. 2 Foundry	23.50 to 24.00
No. 2 Plain	23.00 to 23.50
No. 1 Southern Foundry	22.50 to 23.00
No. 2 Southern Foundry	22.00 to 22.50
No. 3 Southern Foundry	21.50 to 22.00
No. 4 Southern Foundry	21.00 to 22.00

Finished Materials.—Some important structural contracts have been let during the past week, the most important being the Susquehanna bridge of the Baltimore & Ohio, about 15,000 tons of which went to the American Bridge Co. after long negotiating. The same interest has also taken a viaduct for this railroad, calling for 1,600 tons, and bridge work, amounting to 1,900 tons for the Chicago & Northwestern, and 2,000 tons for the German-American Insurance building in New York. Bookings by outside interests have not been large. Orders for steel for the new plant at Gary, Ind., are coming in steadily. As indicating the progress of the work, it is interesting to note that out of the 55,000 tons of structural steel originally arranged for with the American Bridge Co., specifications have been given for about 40,000 tons.

In this district and New England, there is practically no new business in bar iron. The immediate needs of consumers seem to be well covered and they are content to play the waiting game in the hope of lower prices. The strength of the scrap market, however, and the heavy volume of specifications—in many cases calling for anticipations of many weeks—indicate that the chances of a decline are remote. So briskly are specifications being received at the mills that contracts which normally would not have been exhausted until well along in the summer will shortly have to be renewed. In cast iron pipe only the usual run of small lots is reported, with occasional export inquiries which may develop into business later.

The following are prices at tidewater:

Angles, 3 to 6 inches x ¼ inch and heavier, 1.84½c; beams, 3 to 15 inches, 1.84½c; tees, 3 x ¼ inch and heavier, 1.89½c; plates, carloads, tank, 1.94½c; marine boiler, 2.24½c refined iron bars, 1.89½c; soft steel bars, 1.74½c; sheets, No. 28, black, 2.60c.

Old Materials.—The past week has been marked by heavy selling of practically all lines, heavy melting steel and rolling mill stock leading in activity. Of the former extremely heavy sales have been made in the east, in some instances directly from steel mill to furnace. The movement has developed considerable eagerness on the part of dealers to dispose of their accumulations and the competition for business has resulted in some shading of prices formerly holding. We quote, New York delivery, gross tons, as follows:

Old iron rails	$23.50 to 24.50
Old steel rails, long lengths	18.00 to 18.50
Old steel rails, short pieces	16.00 to 16.50
Relaying rails	28.00 to 29.00
Old car wheels	22.00 to 23.00
Old iron car axles	28.50 to 29.50
Old steel car axles	21.00 to 21.50
Heavy melting steel scrap	16.00 to 16.50
No. 1 railroad wrought scrap	19.50 to 20.00
Iron track scrap	17.50 to 18.00
Wrought pipe	14.50 to 15.00
Cast borings	12.50 to 13.00
Wrought turnings	14.75 to 15.25
Heavy cast scrap	19.50 to 20.00
Railroad malleable	19.50 to 20.50
Agricultural malleable	14.50 to 15.00
Stove plate	16.00 to 16.50
Grate bars	14.50 to 15.00

BUFFALO.

Strong Demand for Spot Iron and Supply is Not Adequate.

April 8.

Pig Iron.—The market is full of inquiries for prompt delivery foundry iron and one large concern with branches in a number of cities has tried hard to secure 5,000 tons for prompt shipment. The furnaces, being pretty well sold up for the year, were unable to fill the order and prompt iron is not obtainable. Several who are in touch with the local situation describe the market as decidedly inactive by reason of the fact that the furnaces cannot accept most of the business offered.

Inquiries come mostly from the smaller consumers who have not provided for the immediate future, most of the inquiries being for two, five or ten hundred tons of prompt, the larger consumers, having, generally speaking, covered well through the year. Prompt iron could bring advanced prices if it were to be had and consumers who are uneasy continue making offers of high prices for small shipments to be delivered at once. Very little English iron has found its way into this district lately and valley furnaces are holding back. The valley product is reported limited now on account of many furnaces being blown out for re-lining.

In tone the market is strong and each week it has been growing firmer. This change is gradual but without any change in prices, these having continued since the first of the year with but little variation. Furnace men say they are "just waiting developments." They are doing a little selling for last half. This week the buying started out light for the late deliveries. Consumers supplied in this territory are paying a good deal more attention to their present needs than to iron for last half delivery. As last half iron is nearly bought up, it is a problem what many buyers will do later in the year when they find themselves confronted with no iron in sight for prompt delivery and a market covered for many months ahead. We quote, for last half delivery, as follows:

No. 1X Foundry	$22.75 to 23.25
No. 2X Foundry	22.25 to 22.75
No. 3 Foundry	21.50 to 22.00
No. 2 Plain	22.00 to 22.50
Malleable Bessemer	22.50 to 23.00
Gray Forge	21.50 to 22.00
Charcoal	26.00 to 27.00

The Ashland Iron Mining Co., Ashland, Ky., blew in its No. 1 furnace on March 23, after a shut-down of 22 days for relining.

ST. LOUIS.

Settlement With Molders.—Little Activity in the Pig Iron Market.

April 8.

The threatened strike of the iron molders has been deferred until July 1. On April 1 the stove molders demanded an increase of 20 per cent and the machinery molders an advance of 25 cents a day. The stove men have settled the differences with their molders by granting a five per cent advance. The machinery houses have granted an advance of 15 cents to their molders. The latter accepted the additional wage, but gave notice that they would demand the remaining 10 cents on July 1. The melters intimate that they have made all the concessions they intend to make, and thus the matter stands. No molders in this immediate district are out.

Pig Iron.—All deliveries have ruled quiet and somewhat easier during the week, few indications of life being displayed. Some small orders were placed but they were mainly to "piece in" and tide over till contract iron arrives. Deliveries are so much improved from the south that spot is not in great demand, and the price is easier. Southern No. 2 for immediate delivery can be freely bought at $22.50, though in some instances No. 2 on track still commands $23.

Reports are again in circulation of $18 iron for last half, but small orders are booked at $18.50 for southern No. 2. Second quarter is quoted at $21.50.

Inquiries are quiet. The leading car interest wants about 1,000 tons for second quarter, but is waiting before covering for the last of the year.

Our quotations, including the freight rate of $3.75 from Birmingham, range as follows:

Southern No. 1	$22.25 to 22.75
Southern No. 2	21.75 to 22.25
Southern No. 3	21.25 to 21.75
Southern No. 4	20.75 to 21.25
Gray Forge	19.75 to 20.25

Coke.—Coke is easier and freely offered for all deliveries at from $3.75 to $4.00.

BIRMINGHAM, ALA.

Sales Exceed Production. — Railway Service Greatly Improved.

April 8.

Sales of pig iron in the southern territory during the first week of April aggregated more than the production during the same period. There is a lively inquiry for iron and a number of good sized sales are looked for in the next few days. All iron being sold now is for delivery during the last quarter of the year. Second quarter iron is spot and is hard to obtain even in fifty-ton lots. Third quarter iron is not so plentiful as some might think. The production is still short; in fact, temporary repairs being necesary about furnaces caused several to lose some time in the past week or two. The Southern Steel Co. had its furnace at Gadsden down for a few days making necessary repairs. The work of repairing in this state is being pushed right along, but there appears to have been an underestimate of time required to place the iron makers in condition to resume operation. The Sloss-Sheffield Steel & Iron Co. has five out of seven furnaces in blast. One of the other furnaces will be ready for the torch in another month and the seventh one will be in condition to go to work in sixty days. In that time, however, one of the furnaces in blast now will have to be blown out for repairs, so that there will be but little difference in the long run as to the production. The Tennessee Coal, Iron & Railroad Co. has several furnaces out for repairs and the work being done about the iron makers appears to be progressing very slowly. Other companies are similarly located. In addition to furnaces being out for repairs the raw material supplies, especially ore, are not up to the requirements. Efforts to improve conditions in that line made lately are not bearing fruit rapidly. Several ore mines are being improved in order to bring about an increased production. Some new mines are being located.

The railroad situation in Alabama is greatly improved and the shipments being made now are greater than the production. The accumulated stocks of pig iron and cast iron pipe are beginning to dwindle.

Quotations are firm in this district. If there was any spot iron to be had, $23 and $24 per ton, No. 2 foundry, is the price mentioned. Third quarter iron commands more than $20.50 per ton, while fourth quarter product is bringing between $18.50 and $19 per ton.

BRITISH IRON MARKET

Declining Nearly a Dollar Since Feb. 1.—Effect of Wall Street Reports.

Office of THE IRON TRADE REVIEW.
Prince's Chambers, Corporation St.
Birmingham, Eng., Mar. 29

The pig iron market, although showing greater firmness during the past week, is still tending downwards. Thus prices which at the middle of the month were £2 14s 2d ($13.26) for Cleveland were yesterday £2 13s 3½d ($13.05), this representing a net decline on the day of 9½d. The tendency of the market is very well shown by a comparison with the beginning of February when Cleveland realized £2 16s 11d ($13.92) cash. Yesterday's decline was mainly due to sensational Wall street reports and to the rumored failure of a Berlin speculator in metals. Yet, in spite of these depressions, the sales continue to be substantial, yesterday's transactions for example totaling 30,000 tons. The latest reports of iron in store put the amount on Saturday last at 477,515 tons. The Midland district has once more shown its independence of Cleveland by increasing its purchases during the past week, some sellers on Thursday last having realized from 6d to 9d over the prices of week before. There is very little disposition to make concessions in such pig iron centers as Northamptonshire, Derbyshire, and Nottinghamshire. In fact, users are reduced to such extremities that some of them are quite ready to offer a premium for prompt deliveries. Orders of from 500 to 1,000 tons are becoming common. There are great complaints about the price of coke. One large smelter has just renewed his contract for fuel. Five months ago the quotation was 16s a ton; now it is 23s. He will consider himself fortunate if he books at 22s. As a ton and half of coke is required to produce a ton of iron, it will be seen that the cost of iron has been increased by at least 8s per ton. The increase of pig iron over this period has been comparatively trifling, so that it will be seen there is not much for the producer in such pig iron advances as have been secured. With the summer in prospect, when the scarcity of slack always tends to coke advances, it will be seen there is very little prospect of relief in this direction.

A Word of Explanation.

Editor IRON TRADE REVIEW:

Would it not be well for you to call the attention of your readers to the fact, which may not be obvious to some of them, that your quotations of pig iron furnished by your correspondent in Birmingham, England, are for iron at the furnace plants. To those prices must be added about $6 before the iron is laid down on this side of the water and inland freight charges to destination must also be taken into account. The $6 is made up of $4 duty, about $1.70 ocean freight and approximately 30 cents to cover insurance, agents' commission and other charges; it does not include anything to recompense the importer for that capital and risk involved.

IMPORTER.

METAL MARKET.

NEW YORK.

April 9.

Copper.—Dependable figures on the copper movement of the first quarter are now available and indicate an accumulation of stocks for the three months of approximately 10,000 tons, to be added to whatever surplus was on hand Jan. 1. During this period a conservative estimate of production in this country is about 95,000 tons. To this must be added imports of approximately 30,000 tons, making the total available supply 125,000 tons (gross). Domestic consumption during the period is estimated at 75,000 tons and exports have been in the neighborhood of 40,000 tons. These two items total 115,000 tons, leaving the surplus for the quarter 10,000 tons. Most of these figures are only estimates, but they are conservative in every item and official statistics will not differ greatly. The heavy decline abroad, coupled with the light demand from consumers, has rendered the local market extremely weak and erratic. Current quotations are as follows: Lake, 25c to 25½c; electrolytic, 24c to 24½c; castings, 23c to 23¾c. On the London market yesterday standard spot closed at £98 2s 6d.

Pig Tin.—The stronger situation in the London market has continued and the effect is being felt locally, though current sales are not important. The domestic quotation is 40c to 40½c for June to spot delivery. London spot closed yesterday at £184 10s. April arrivals total 727 tons, with about 2,500 tons afloat.

Pig Lead.—Lower prices prevail with only a limited demand. We quote spot 6c to 6.10c. Soft Missouri is slightly under 6c for spot and soft Spanish closed yesterday in London at £19 11s 3d.

Spelter.—Refined is held at 6.75c to 6.80c for carload lots, spot delivery; St. Louis at 6.70c to 6.75c; and G. M. B. closed yesterday in London at £25 17s 6d.

Antimony.—Spot Cookson's is held at 23c to 23½c; Hallett's at 21c to 22c and ordinary brands at 20½c to 21½c. The demand is light and the market easy.

CHICAGO.

April 8.

Continued quiet prevailed in the Chicago metal market during the week. Small purchases were made by railroad for current needs. The only apparent change in price was the slight drop in the cheaper grades of antimony.

Copper lake sold at 27c and casting between 26¼c and 26¾c. Pig tin sold between 43c and 43½c, according to the quantity bought. Sheet zinc was quoted at 8.50c LaSalle in car lots of 600-pound casks. Spelter remained at 7¼c. Lead desilverized sold for 6.50c to 6.60c for 50-ton lots, and corroding at 7.25c to 7.35c. Carload lots were held 2½c per 100 pounds higher. For Cookson's antimony 28½c was asked; other grades dropped from 26½c to 26c.

The slump in the price of old metals observed last week continued without change. Prices quoted by buyers were: Copper wire, 18.50c to 19c; heavy copper, 18c; copper bottoms, 17.50c to 18c; copper clips, 18.50c to 19c; red brass, heavy, 17.50c to 18c; yellow brass, heavy, 15c to 15.50c; red brass borings, 15.50c to 16c; yellow brass borings, 13.50c to 14c; light brass, 12.50c; pipe lead, 5.25c; tea lead, 5c; zinc, 5c; tinfoil, 33c; pewter No. 1, 27c.

ST. LOUIS.

April 8.

Lead is quiet. It is salable at $5.95 to $5.97½, but is held higher.

Spelter is nominal at $6.70.

Shipments of zinc ore in the Missouri-Kansas field were 650 tons less than last week. Lead ore prices were higher.

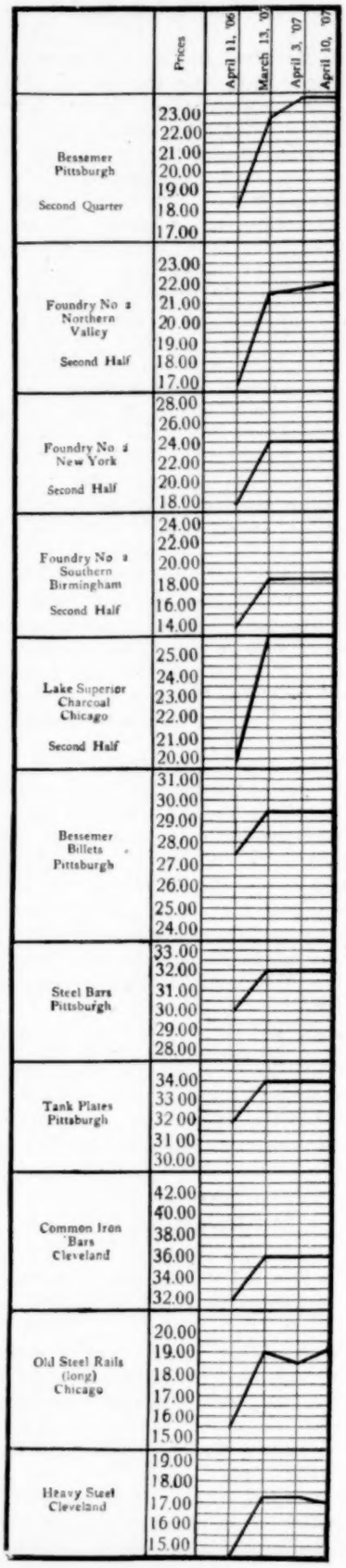
INCREASES SURPLUS.

A handsome addition to surplus from operations during the year ending Dec. 31, 1906, is shown in the annual report of the Ingersoll-Rand Co., New York, manufacturer of air compressors, rock drills, pneumatic tools and general mining, tunneling and quarrying machinery, which has just been issued. The statement of earnings is as follows:

Earnings of properties for year 1906	$1,638,936 93
Regular provisions for depreciation	369,707 46
Net earnings for year	$1,269,229 47
Interest, dividends and special reserve	$ 984,901 00
Net addition to surplus for year	$ 284,328 47
Surplus Jan. 1, 1906	177,423 57
Total surplus	$ 461,752 04

New Orleans Metal Trades.—A vigorous association of more than twenty members has been organized by the metal trades interests of New Orleans. Lewis Johnson, of the Johnson Iron Works is president, John Murphy vice president, Charles Joubert, of Payne & Joubert treasurer, and Henry Stearn secretary. Offices have been opened and a labor bureau will be kept in operation. Within a short time, it is stated, the entire membership of the local will be affiliated with the National Metal Trades Association. Henry C. Hunter, of the New York and New Jersey branch assisted in the organization work.

PRICE CHART.



PERFECTING PLANS

For American Foundrymen's Convention.—The Supply Association.

The annual meetings of the Foundry Supply Association and the Associated Foundry Foremen will be held in Philadelphia similtaneous with the convention of the American Foundrymen's Association, May 20 to 24. The record-breaking attendance of foundrymen from all sections of the country already promised will afford other organizations allied with the trade excellent opportunities of holding their periodic meetings at this time. A lively interest is also being manifested in the organization of the Brass Founders' Association, special invitations having been sent to all allied with this industry by C. J. Caley, vice president of the American Foundrymen's Association, urging them to attend.

At a meeting of the executive committee of the Foundry Supply Association held March 30 at the Hollenden hotel, Cleveland, president S. T. Johnston and Secretary H. M. Lane reported the results of their recent trip to Philadelphia, where a meeting was held with E. H. Mumford and Howard Evans, members of the executive committee of this organization, and Dr. E. E. Brown, who represented the entertainment committee of the Philadelphia Foundrymen's Association. It was reported that the latter, through its committees, would attend to all the arrangements for entertainment in connection with the convention, but would leave the exposition feature to the Foundry Supply Association. The sessions of the American Foundrymen's Association and the exhibits will be free, but the entertainment, which will consist of a shad dinner, river trip, smoker, etc., will be confined entirely to members of the American Foundrymen's Association, Foundry Supply Association, Associated Foundry Foremen, Philadelphia Foundrymen's Association, and visitors who will go to Philadelphia to join the Brass Founders' Association. Inasmuch as the members of the Foundry Supply Association are likewise enrolled in the American Foundrymen's Association, they will be entitled to two representatives each who can partake of all of the entertainment features. Firms associated with the Supply Association will be permitted to have additional representatives present, by the payment of $15 per person, which will include all of the privileges of the convention, including entertainment. Representatives or employes of firms who attend as clerks, demonstrators, etc., but do not partake of the entertainment, will not be considered as representatives and will not be registered in the regular attendance list.

The finances of the Foundry Supply Association were carefully considered, and from present indications there will be sufficient revenue from the rental of space to cover all of the expense of the exhibit. Music will be engaged to be in attendance at the armory throughout the gathering, provided the amount of space sold aggregates $2,450. Two tickets will be furnished each concern, which should be presented at the registration desk at the time the firm's representatives apply for registration to secure credentials for entertainment, etc. If the concern desires additional tickets, the secretary should be notified before the convention, to avoid confusion.

Every effort is being made to have the railings and signs for the booths as uniform as possible. The signs above the exhibits are to be confined to a height of 12 feet from the floor and the railing to a height of 34 inches from the floor. The width of the signs is limited to 30 inches. Up to the present time, 75 firms have been enrolled as members of the Foundry Supply Association and more than 50 have made application for space. The question of revising the constitution was discussed at length, and it was finally decided to defer action until the Philadelphia meeting. Those in attendance included: S. T. Johnston, president; E. A. Kebler, second vice president; J. S. McCormick, treasurer; H. M. Lane, secretary; U. E. Kanavel, J. S. Smith and H. E. Mills, members of the executive committee.

MACHINERY AND METAL CLUB

Will be Organized in New York.—Will Occupy Two Floors of Terminal Building.

New York is to have a machinery club. The preliminary steps for its organization were taken April 4 when a meeting of those interested was held in the rooms of the board of trade and transportation and the project was explained to more than one hundred and fifty connected with the machinery and metal trades. The plan is to organize a club similar to those now existing for other branches of commercial activity, such as the Drug Club and the Hardware Club. Quarters are to be taken in the new Fulton terminal building, now being erected at Church, Dey and Fulton streets at the end of the New Jersey tunnels under North river. This building, which will be largely tenanted by concerns in the machinery and metal lines, is promised for occupancy May 1, 1908. At that time the new club will take possession of the entire twenty-first and twenty-second floors, which will be arranged particularly for this purpose and will permit of establishing a roof garden lunching place which is expected to prove an attractive feature.

At the meeting last week, F. H. Stillman, of the Watson-Stillman Co., presided and reviewed the many arguments for such an organization. He told of the inception of the idea years ago, commenting on the fact that, though one of the most important in the city, this branch of trade lacked the important assistance such as a lunching club would provide. It is expected that the membership limit will be 750, with an unlimited non-resident list. Mr. Stillman has already received advices from more than 325 that they will join and the enthusiasm manifested at the recent meeting indicates the complete success of the enterprise. Theodore Waters, of the Hudson companies, in charge of the building, served as secretary. As a committee to select a list of twenty-five or more to assume charge of the organization work, the following were appointed:

George L. Gillon of the Watson-Stillman Co.
Charles A. Schieren Jr.
Frank Clark.
John Ellice.
Edwin H. Benners.

The names reported by this committee, together with a few additions suggested by others in attendance, are given below, it being stipulated that Mr. Stillman serve as chairman:

John Derby, Manning, Maxwell & Moore.
James R. Van Dyke, Van Dyke-Churchill Co.
A. B. See, A. B. See Co.
M. K. Bowman, James Reilly Repair & Supply Co.
Henry Prentiss, Prentiss Tool & Supply Co.
C. A. Hungerford, Morris Machine Co.
Allen M. Rogers, H. A. Rogers Co.
Carl D. Bradley, S. L. Moore & Sons Corp.
John A. Schroeder, Mesta Machine Co.
C. E. Watrous, Cutler-Hammer Mfg. Co.
Geo. A. Howells, Ingersoll-Rand Co.
H. F. Frevert, Frevert Machine Co.
Walter L. Pierce, Lidgerwood Mfg. Co.
G. K. Hooper, Consulting Engineer.
Edwin H. Benners, Crown Castings Co.
Thornton N. Motley, T. N. Motley & Co.
John J. Cone, Robert W. Hunt Co.
George E. Molleson, Tylor Tube & Pipe Co.
John A. Hill, Hill Publishing Co.
Percy A. Ware, *Iron Age*.
H. C. Hunter, Nat. Metal Trades Association.
Fred Stadelman, Wellman-Seaver-Morgan Co.
William Hoxie, Babcock Wilcox Co.
F. H. Stillman, Watson-Stillman Co.
Theodore Waters, Hudson Companies.
Robt. C. McKinney, Niles-Bement-Pond Co.
Geo. L. Gillon, Watson-Stillman Co.
Thos. B. Bryson, Thomas B. Bryson & Co.
W. P. Pressinger, C. P. Tool Co.

Furnace No. 1 of the Dunbar Furnace Co., Dunbar, Pa., has been banked since March 24.

The Keystone furnace of the Reading Iron Co., Reading, Pa., was blown out on March 5 for repairs.

THE IRON TRADE REVIEW

Devoted to Iron and Steel Manufacture and to the Machinery, Metal-Working and Foundry Trades,

PUBLISHED EVERY THURSDAY BY
THE PENTON PUBLISHING CO.
CLEVELAND.

BUFFALO .....932 Ellicott Sq.
CHICAGO ..... 1362 Monadnock Blk.
CINCINNATI ..... 124 Government Place.
NEW YORK ..... 150 Nassau St.
PITTSBURG ..... 521 Park Bldg.
DULUTH

Subscription, $3.00 per annum. To Foreign Countries, $4.50. Advertising Rates Furnished on Application.

Change of advertising copy must reach this office ten days preceding date of publication.

The Cleveland News Co., will supply THE IRON TRADE REVIEW through the regular channels of the American News Co.

European Agents: The International News Company, Breams Building, Chancery Lane, London, E. C., England.

ENTERED AT THE POST OFFICE AT CLEVELAND, AS SECOND CLASS MATTER.

PRINTED IN AN OPEN SHOP

April 11, 1907.

GETTING BACK TO FIRST PRINCIPLES.

In an able address recently delivered at the annual banquet of the Merchants' and Manufacturers' Club at Greensboro, N. C., President Finley, of the Southern Railway Co., discussed a number of subjects relating to the railroads in which the public is now taking keen interest. We wish briefly to refer to his treatment of the topic of railway rates.

President Finley asserts that railway rates are difficult for the lay mind to understand, because they are subject to no mathematical standard, but are the outgrowth of economic laws and economic conditions. He adds:

Cotton goods, for example, are manufactured in Georgia and Alabama and are likewise manufactured in New England. Their common market is New York. The mills of Georgia and Alabama are 800 miles distant from this market. The mills of New England are 100 miles away. The economic law is that, if the product of the southern mills is to be sold in the New York market in competition with the products of the New England mills, they must be placed there by the transportation company at rates which will permit of this competition. This rate is, therefore, made by the economic law of the competition of producing localities.

Again, granite blocks or manufactured bricks are selling in a certain market at a certain price for building purposes. Another commodity, such as manufactured stone, seeks admission to the same market as a substitute for granite and brick. It is to the interest of the carrier to make a market for it. To do so, a rate must be given that will enable it to be sold on a competitive basis with the commodities it seeks to displace. This rate is thus made by an economic law which is known as the competition of commodities.

After giving these illustrations, President Finley declares that if rates were made without a full recognition of the economic laws which control the movement of traffic, business dependent upon the rates would be prostrated and destroyed, and that no rate can be established by legislating independently of these economic laws without disastrous results. "In a broad sense," says Mr. Finley, "the management of the railroad is powerless to fix these rates. It must accept the rates that are the result of economic and commercial forces, which are as absolutely beyond the control of its managers as are the tides of the ocean."

We are not disposed to dispute the fact that the railroads are compelled to recognize conditions as they exist in the competitive world of business, but it ought never to be forgotten that the railroads, like all other human agencies, are subject to the laws of justice and fair dealing. There is no ethical justification for an action which permits the railroads to build up one section of the country by giving it advantages to which its location does not entitle it. If the mills of Georgia are 800 miles distant from the cotton goods market, they have a natural handicap of which the railroads have no right to relieve them at the expense of the mills of New England. We do not believe there is any law based on sound economy which builds up the industry of one community for which another is naturally better adapted. No railroad has the moral right to injure the business of selling granite blocks by hauling manufactured stone at a lower rate than it ought to pay as compared with other products. When President Finley speaks of economic laws, he really means customs or practices which are the result of competition. It is folly to say that because a certain practice exists, it is established in accordance with economic law; it may prevail in plain defiance of sound economic conditions.

All Americans are supposed to favor free trade between the states, but the country really does not and can not enjoy it as long as the railroads exercise the power which they have today. Competition now compels the making of rates in accordance with such practices as those described by President Finley, but as more and more we look at these railroad problems from a broad, national standpoint of justice and square dealing, ensuring fair treatment of all parts of the country, the establishment of freight rates will be made more nearly in accordance with sound principles, and every community will have a chance to develop to the greatest extent along the lines for which it is best adapted.

THE STEEL CORPORATION AND CRUDE STEEL.

It will be recalled that when the United States Steel Corporation was formed fears were expressed by economic writers, and entertained to an extent by some independent consumers of steel, that the corporation would refuse to sell crude steel to outside interests, and would retain its entire production for its own finishing mills. By such a procedure, it would, for the time at least, maintain a better control of the markets as a whole and be able to obtain better prices for the material it sold. Last year statements were made that the corporation management had decided to enter into no new contracts for the sale of unfinished steel, and would gradually reduce its obligations by refraining from renewing existing contracts, from time to time cancelling contracts which contained a proviso for cancellation. It is well known that such a principle was more or less formally adopted at the time, and that the statements printed had a measure of official sanction. They were not, however, in such form as to be excluded from the disclaimer which the corporation printed in its annual re-

port for 1903, and which said: "From time to time information relating to the affairs of the corporation is given out by officials for publication; but it is the rule in such cases to accompany the statement with the name or office of the official making the statement, and no publication should be considered authoritative unless so identified." The statements regarding abstention from the sale of crude steel were not "so identified," and it will do no harm to remind the iron trade, as to this and other matters as well, of the official disclaimer which has not been withdrawn.

Obviously it is better for the United States Steel Corporation that it should sell a ton of finished steel than a ton of billets or sheet bars. It is equally obvious that it is better for the corporation to sell crude steel to an established finishing interest than that that interest should build a steel plant and make the steel for itself. The whole fabric of the steel corporation rests upon its conversion of an enormous amount of capitalized raw material into finished products for sale as rapidly as possible. It is so situated that it can apply extra profits immediately to the purchase of outstanding bonds and mortgages, or pass them into sinking funds, while in addition the growth of steel demand makes feasible the erection of additional plants to consume the raw materials. Indeed, the steel corporation did not hesitate two years ago to make a long term billet contract on terms very favorable to the consumer, when that consumer was an interest apparently prepared to build its own steel plant.

Whatever policies or principles may have been adopted under certain conditions, there is no question that problems as they arise will be dealt with according to existing physical conditions. If the corporation at any time has an excess of steel making over finishing capacity, and is confronted with the possibility of that excess lying idle, it will sell crude steel if it can find a customer at any profitable price.

Unexpected testimony that such a condition as to excess of steel making over finishing capacity is likely to develop is found in the last annual report of the corporation, a table, which was reproduced in these columns at the time, showing the increase in the corporation's capacity from its organization to Jan. 1 last, in blast furnace products, steel ingots, semi-finished steel, and finished products. The increase in finished steel and iron products is shown to have been 44.33 per cent, while the increase in blast furnace products is 63.12 per cent, in steel ingots 56.64 per cent, in blooms, billets and slabs 61.77 per cent, in sheet bars 89.05 per cent and in wire rods 13.18 per cent.

The increase in blast furnace capacity of 63.12 per cent, against an increase of only 44.33 per cent in finishing capacity, represents a large increase in the corporation's make of pig iron, relative to the steel needs of its finishing mills, and running, in point of tonnage, to well over a million tons. Now, while the purchases of pig iron in the central west have been quite irregular, they were largest in 1902, and in that year amounted to only about 300,000 tons. Accordingly, the corporation's greater increase in blast furnace capacity than in finishing capacity has given it additional pig iron, much more than enough to represent the heaviest purchases of outside pig iron it previously made, and the increases it has made in finishing capacity. As it has made a large increase in steel making capacity, its present pig iron and steel capacity, relative to finishing capacity, is much larger than it was when it was organized, at which time it was a larger seller of crude steel than it has been of late.

The report furnishes no reason for an assumption that the percentage increases named include capacity to become productive after Jan. 1 last, and on which construction work is now in progress, since in a paragraph following the percentage tabulation reference is made to further extensions, which are now in progress. It is well known that a greater part of the steel corporation's new construction at present is in the line of increased pig iron and steel making capacity. It is true that its present finishing capacity has of late not been fully employed, on account of shortage of steel. With the greater increase in steel making capacity to Jan. 1 last, and the further preponderance given by the present new erection, there will evidently be a balance of large proportions left for the open market.

Another factor of great importance is to enter into the situation. It has been an axiom in the American iron trade that finishing capacity, with a given producer making a variety of products, must be in excess of steel making capacity, because the relative demand for different finished products fluctuates, and steel making capacity must be kept fully employed on account of the large capital tied up in steel making and precedent operations. The condition which has existed in the American iron and steel trade for several years, of practically all finishing departments being under high pressure, is an unusual one. It is quite abnormal. A return to normal conditions, which cannot be so long delayed, will involve much greater pressure in some finishing departments than in others, and thus will suddenly release some crude steel. Possibly that change may first manifest itself by reason of the decreased railroad buying which is expected.

There is every reason to anticipate, therefore, that the United States Steel Corporation will at some time within the next few years be found a much more enthusiastic seller of crude steel in the form of billets and sheet bars than it has been in the recent past. Export sales can be counted upon, but only to a relatively limited extent. The corporation has wisely been pushing its exports into finished lines, which constitute a much greater percentage of total iron and steel exports than they did a few years ago. In 1904 our total iron and steel exports amounted to 1,167,678 gross tons, of which 314,324 tons was crude steel and 414,845 tons rails. In 1906 the total had risen to 1,325,157 tons, while crude steel dropped to 192,616 tons and rails to 328,036 tons. In 1904 crude steel and rails constituted 62.4 per cent of our total iron and steel exports; in 1906, only 39.3 per cent.

WILL BUILD PLANT.

The Chicago Railway Equipment Co. states in its annual report that it has recently acquired seven acres in the stock yard district upon which it will erect a modern plant during the year. The report says "the plants in Detroit, Jersey City and Canada, as well as those in Chicago, are declared to be in excellent condition, and the Grand Rapids Malleable Iron Works, purchased in 1905, has been a paying investment." The condensed general balance sheet of Dec. 31, 1906, follows:

Assets.—Real estate buildings, machinery patents and good will, $3,783,236; office furniture and fixtures, $3,599; material on hand, $794,613; accounts receivable and cash, $906,153; total, $5,487,601.

Liabilities.—Capital stock, $2,500,000 (less $20,000 in the treasury), $2,480,000; five per cent mortgage bonds, $215,000; bond guarantee fund, $500,000; accounts payable, $133,533; capital and surplus account, $2,159,069; total, $5,487,601.

San Francisco's Progress.—The progress of reconstruction work at San Francisco during the month of March is shown by the bulletin issued by the California promotion committee. The summary shows building permits issued during March to the value of $8,203,880, and the total value of permits issued since the fire of $55,058,756; real estate transfers were 880 of the value of $4,100,000; postal receipts, $138,350; custom receipts, $660,280.39, as against $696,021.36 in March, 1906, and bank clearings, $187,870,476.70, compared with $185,417,224.93 during March, 1906.

Acquire Club House.—The Cleveland Manufacturers' Club, recently organized in that city, has purchased a permanent home at 1420 East Fortieth street. At present only the lower floor of the club house will be occupied. It contains four rooms, which will be converted into lounging, smoking and dining rooms and a kitchen. The building will be formally opened the first week in May. Fifty factories are members of the club. The associate membership is limited to 50 per cent of the active membership. The officers are: President, W. D. Sayle, president of the Cleveland Punch & Shear Works Co.; vice president, W. A. Comstock, secretary and treasurer of the Cleveland Wire Spring Co.; second vice president, William F. Billstein, of the National Iron & Wire Co.; secretary, Albert F. Schroeder, secretary of the Globe Machine & Stamping Co.; treasurer, C. S. Kurtz, of the Cleveland Store Fixture Co.

HEARNE'S POLICY

Will Be Continued by the New President of the Colorado Fuel & Iron Co.

Pueblo, Colo., April 8.—One of the improvements at the Colorado Fuel & Iron works, which will add greatly to the switching facilities of the Colorado & Wyoming, is a new three-rail track which will run parallel to the new open-hearths. It will be for both broad and narrow gage cars, and will connect several of the more important lines now in use.

New coal chutes, to be operated with the latest mechanism, will be built on the new tracks. At the present time, there are only two chutes at the Minnequa plant, and they are not of sufficient capacity to facilitate the coaling of engines.

The members of the engineering corps of the University of Colorado visited the Minnequa plant last week, spending most of the time in the wire and rod mills and in the blast furnace department.

J. F. Welborn, the newly appointed president of the Colorado Fuel & Iron Co., made his first official visit to the plant this week. Upon accepting the position, Mr. Welborn stated that he considered his appointment merely as a confirmation of belief in the policy of the late Mr. Hearne, and that there would be no cessation whatever in the improvement work at the Pueblo plant.

Work is progressing on the second track between the steel works and the southern reservoirs. It has been found impossible to carry all the refuse of the mills to the reservoirs on one line, hence the building of the double track in order that all may be in readiness for the opening of the new furnaces.

P. D. Mackay, who for a number of years has been assistant superintendent of the converter department at the steel works, has resigned and will leave at once for Denver, where he will assume the position of general manager for the Western Iron & Steel Co. Mr. Mackay is recognized throughout the country as a capable steel and iron man, as he has had a large and varied experience in Homestead, Braddock and in Pueblo with the Colorado Fuel & Iron Co.

The bridge and structural iron men in the employ of the Patterson Construction Co. have finished their labors on the new blast furnace, the work having progressed to a point where it can be finished by the steel works riggers and their assistants.

TO DEDICATE INSTITUTE.

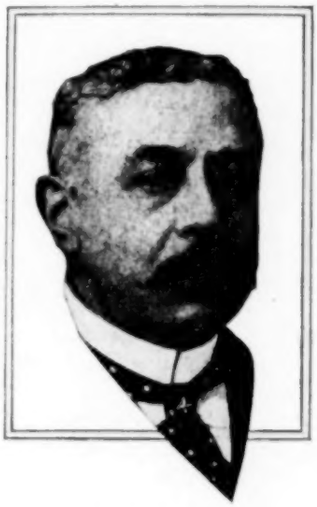
Attended with pomp and splendor and in the presence of distinguished guests from the old and new world, the magnificent Carnegie institute, the gift of Andrew Carnegie to the city of Pittsburg, will be formally dedicated April 11, 12 and 13. The faculty and students of the Carnegie Technical Schools are making special preparations for the event. Ten banners carrying out the Carnegie plaid, in which is found the four colors, red, blue, green and yellow, will be borne by the students in the procession, which will mark the opening of the ceremonies. One of these basic colors has been selected by each of the four branches of the schools, the department of applied science, of apprentices and journeymen in the building of machinery trades and of applied design. The women's department will adopt the background of the banner, across which, at top and bottom, is a broad strip of Carnegie plaid, while inscriptions in white lettering designate the particular department. With the faculty at their head, the 1,400 students will line up in a double row in front of the institution through which the distinguished guests will pass. Two days have been set aside for the inspection of the institution.

Heavy Rails Ordered.—Announcement was made by President Henry J. Pierce, of the International Railway Co., of Buffalo, N. Y., this week that an order had been placed by the company for $75,000 worth of steel girder rails to be rolled at the steel plant at Lorain, O. It is expected the first deliveries will be made in June. The company states that the rails will be 140 pounds to the yard. No heavier rails are used in this country and few cities have introduced them. The new system at San Francisco will have 140-pound rails. Some tracks have been laid in Philadelphia, and Albany, N. Y., of rails of this weight. The order placed by the International Railway Co., is to cover improvements and extensions of its lines in the city of Buffalo. It is also stated that all further building by the company will be of the 140-pound rail. The heaviest now used by the International is 90 pounds.

The current reports that the Republic Iron & Steel Co. is about to begin the work of putting in new open-hearth furnaces or new mills at its Youngstown plant is not verified by officials of the company.

DEATH OF THEODORE D. BUHL.

Theodore D. Buhl, numbered in the first rank of Detroit's most prominent and successful business men, died suddenly in New York city, April 7. Mr. Buhl had started for a walk from the Waldorf-Astoria hotel, where he was a guest, when he was stricken with apoplexy and fell dead upon the street. He was alone at the time, his wife and grand-daughter who were with him in New York, having remained at the hotel when Mr. Buhl started upon his walk. In the death of Mr. Buhl the business world of Detroit is deprived of one of its most striking figures. Endowed with a keen business insight



THEODORE D. BUHL.

and forethought, which had made his father successful before him, Mr. Buhl was enabled to attain even greater achievements in a business way than his parent after he was called upon to take charge of the extensive interests of the latter. He was born in Detroit, Aug. 20, 1845, and was a son of Christian H. Buhl, one of the best known capitalists in Michigan. After obtaining his education in Detroit and New Haven, Conn., he entered into his father's business with his younger brother, Frank H. Buhl, who later became his partner in the Sharon Rolling Mills, Sharon, Pa. The latter's ill health and the death of the parent threw the major responsibilty of conducting the family's large interests upon the elder son. In the conduct of these affairs, he achieved great success. In his industrial interests, Mr. Buhl was president of the Buhl Malleable Co., president of the National Can Co., president of the Buhl Stamping Co., vice president of the Detroit Copper & Brass Rolling Mills, president of the Buhl Sons Co., president of Parke, Davis & Co., in addition to responsible positions in numerous banking and other enterprises. In the malleable iron manufacturing field, Mr. Buhl was particularly prominent. In connection with Thomas H. Simpson, he started the Michigan Malleable Iron Co., afterwards selling out this enterprise to W. C. McMillan and then organizing the Buhl Malleable Co. It is a peculiarly sad coincidence that Mr. Buhl's death occurred within a few weeks of that of the late W. C. McMillan. He was a man of a charitable disposition and many of the worthy institutions of Detroit had been the recipient of his benevolence. He possessed a natural inclination for art and last year served as the head of the Detroit Museum of Art.

John J. Riley, owner of an iron and brass foundry in Brooklyn, died April 1, aged 61.

John Charles Kissack, for nine years owner of the Illinois Steam Boiler Works, died at his home in Chicago, April 2.

Richard M. Waite, assistant to the president of the Colorado Fuel & Iron Co., died Sunday at Denver, Colo., of diabetes. He was 33 years old.

Henry A. Tillinghast, aged 47, secretary and treasurer of the Textile Finishing Machine Co., Providence, R. I., died March 18. He was born in Providence and graduated from the Brown University. He is survived by a widow and two children.

CALUMET STEEL CO. ORGANIZED.

The Calumet Steel Co., Chicago Heights, Ill., with temporary offices at 622 Western Union building, Chicago, has been organized by J. H. Porter and S. S. Porter, formerly vice president and secretary respectively, of the Buffalo Steel Co., Tonawanda, N. Y., and A. S. Hook, formerly secretary of the Inland Steel Co., Chicago. The capital stock is $275,000. Officers have not yet been elected. The company will manufacture a full range of soft steel shapes for agricultural implement purposes; hard steel angles and reinforcing concrete bars. J. J. Worker, formerly superintendent of the Sylvan Works (Moline, Ill.,) of the Republic Iron & Steel Co., will be in charge of mill operations. No contracts for any part of the equipment have been let, and the company invites catalogs from manufacturers of rolls and rolling mill machinery, lathes, planers, shears, punches, air hoists, etc. It is expected to have the plant in operation about October or November. The machine shop is the first building to be erected.

PERSONALS.

Franklin March, of Parkerford, Pa., has been re-elected president of the March-Brownback Stove Co., Royersford, Pa.

George H. Russel, of Detroit, director of the American Car & Foundry Co. and vice president of the Great Lakes Engineering Works, has been elected director of the Canadian Life Assurance Co.

Wallace P. Foote, of Spring Valley, Wis., has been made superintendent of the St. Louis blast furnace to succeed Robert Miller, resigned. Mr. Foote is a Cornell man.

George Collis, secretary and treasurer of the Andrews Wire & Iron Co., Rockford, Ill., has sold his interest in the company to Charles Andrews Jr., and his official duties will be taken up by the latter.

John Simonton, assistant superintendent of the Brown-Bonnell plant of the Republic Iron & Steel Co., has resigned, and has been succeeded by W. J. Marsh, formerly with the Jones & Laughlin Steel Co., Pittsburg.

C. M. Farrar, of the firm of Farrar & Trefts, manufacturers of steam engines, Buffalo, N. Y., is confined to his home in that city seriously ill. A slight improvement was reported in his condition this week, but his many friends are much concerned.

Frank T. Bentley, traffic manager of the Illinois Steel Co., has been chosen president of the Chicago Traffic Club, composed of representatives of various manufactories and railroads. The organization was formerly known as the Traffic Club.

William C. Eaton has severed his connection with the Cincinnati office of Hickman, Williams & Co., and has formed a partnership with Frank R. Rhodes, under the firm name of Eaton, Rhodes & Co. Pig iron and coke will be handled by the new firm. Temporary offices have been secured at 1605 First National Bank building, Cincinnati, with permanent offices after April 1, at 1509 same building.

John R. Magarvey, formerly superintendent of the Dunkirk, N. Y., works of the American Locomotive Co., has been appointed to the office of manager succeeding David Van Alstyne, who was recently made vice president in charge of manufacturing; John R. Marshall, formerly standard practice engineer, has been made superintendent and H. C. Hayes has become standard practice engineer. Earl C. Haggett, formerly engineer of tests, has been promoted to the position of assistant superintendent.

HEAVY PRODUCTION

MADE BY BLAST FURNACES LAST MONTH.

Considering Flood Conditions, an Excellent Record Was Made.—Fewer Stacks in Operation.

Our prediction of last month, that the producing furnace capacity in blast would decrease during March, has been borne out by returns for that period. Reports on the other hand develop an interesting and noteworthy increase in production. It is almost uniformly true of all districts that the furnaces in operation produced individually greater quantities of iron, even above the natural increase due to the longer month. The production in March reached a total of 2,186,709 tons, as compared with 2,047,036 tons in February, which, compared in terms of daily production, shows, approximately, 73,250 tons in February against 70,750 tons in March. Our report, however, shows that there were three furnaces not in blast at any time during March that were producing in February, and one other furnace that went out at the end of March. In addition to this, the reduced daily production may be readily accounted for by pointing out the necessity for banking a large number of furnaces in the flood district for periods ranging from two to eight days. With all these disadvantages considered, therefore, March was a month of large production. In explanation of the form of our report, attention is called to the fact that the furnaces in Tennessee, West Virginia and Kentucky and the furnaces in Maryland, Illinois, Wisconsin and Colorado and those in Georgia, North Carolina, Minnesota, Michigan and Missouri are grouped respectively, because, to present the figures individually would disclose individual furnace production.

Among the furnaces blown out during March were the Keystone stack of the Reading Iron Co., Ohio Iron & Steel Co. stack, Woodward Iron Co. No. 2 stack, Cleveland Furnace Co., South Chicago Furnace Co. furnace "A," Wellston Iron & Steel Co. No. 3 furnace and furnace "A" of the Iroquois Iron Co. Several stacks were blown in, including one stack of the Ashland Iron Mining Co., No. 3 Steelton of the Pennsylvania Steel Co., and one of the old Saxton furnaces now operated by Jos. E. Thropp. It seems probable that during April the tendency will be largely toward increased capacity, as a number of furnaces are about to blow in.

FURNACE REPORT.

State.	No. of stacks.	No. in blast sometime during month.		No. in blast on last day of month.		No. days out of blast per furnace.		Actual make. Steel Co.'s.	Merchant Co.'s.	Total.	
		Mar.	Feb.	Mar.	Feb.	Mar.	Feb.			Mar.	Feb.
Pennsylvania	147	128	131	124	129	4.35	3.13	756,750	180,933	937,683	896,632
Ferro and Spiegel								14,220	4,749	18,969	8,616
Ohio	60	59	58	56	52	1.67	1.25	327,974	154,214	482,188	461,399
Ferro									1,120	1,120	1,311
Alabama	44	30	30	28	29	8.92	8.36	80,994	62,953	143,947	129,890
Virginia	21	18	16	17	15	7	5.67	12,352	30,210	42,562	39,912
New York	24	19	19	19	17	6.96	7.37	77,521	73,530	151,051	125,916
New Jersey	10	9	9	9	9	3.1	2.8		35,567	35,567	29,031
Spiegel									827	827	698
Tennessee	18	12	13	11	11	7	10.1				
West Virginia	4	4	4	4	4	2.5	8.25	32,327	29,279	61,606	60,024
Kentucky	6	3	2	3	2	19	14				
Ferro									2,678	2,678	
Maryland	4	4	4	4	4	0	0				
Illinois	23	20	21	19	21	3.87	2.43				
Spiegel								8,257		8,257	6,244
Wisconsin	6	4	5	3	4	10	1.4	247,525	33,709	281,234	273,472
Colorado	5	4	5	4	4	6.2	4.2				
Spiegel								3,043		3,043	197
Georgia	1	0	0	0	0	31	28				
North Carolina	1	0	0	0	0	31	28				
Minnesota	1	1	1	1	0	0	1		15,977	15,977	13,694
Michigan	1	1	1	1	1	0	0				
Missouri	1	1	1	1	1	0	0				
Totals	377	317	320	304	308	7.93	7.78	1,560,963	625,746	2,186,709	2,047,036

Blast Furnace Notes.

The Northwestern Iron Co., Milwaukee, expects to blow in its new furnace "B" some time in April.

Furnace "A" of the South Chicago Furnace Co., South Chicago, Ill., was blown out on March 22 for relining and for a new furnace shell.

The second furnace of the Woodward Iron Co., Woodward, Ala., to go out of blast was blown out March 15.

The Thomas Furnace Co. had difficulty in working its furnace during the month, due to poor coke.

The Pennsylvania Steel Co. will blow in its idle furnace during April.

The Cleveland Furnace Co., Cleveland, blew out its furnace for relining on March 30.

The No. 3 Steelton furnace was blown in April 6 by the Pennsylvania Steel Co., making every furnace in Dauphin county in blast. One furnace has been idle for several weeks, and has been raised from 70 to 85 feet and equipped with a large centrifugal dust catcher and new down covers. One of the Saxton furnaces in Bedford county, recently bought by Joseph E. Thropp, owner of the Everett furnace, blew in April 2 after a long idleness. The 122 coke ovens and mines will be operated in connection with the Thropp furnaces. The Reading Iron Co. will soon blow in Keystone furnace at Reading, which was stopped by an accident March 6.

The furnaces at the Riverside and Monongahela plants of the National Tube Co., were banked in the aggregate 16 days on account of the flood in that district.

No. 3 furnace of the Wellston Iron & Steel Co., Wellston, O., went out of blast for relining on March 29, after a continuous run of four years and one month.

Furnace "A" of the Iroquois Iron Co., South Chicago, Ill., is out for relining.

The Lebanon Valley Furnace Co., Lebanon, Pa., has added to its equipment a 175-ton ore roaster and a 40-foot track scales of 100 tons capacity.

The W. B. Pollock Co., Youngstown, O., has been awarded the contract by the Carnegie Steel Co., for the erection of two blast furnaces at the Ohio works of that company. The furnaces will be of 500-ton capacity.

Berry Bros., Ltd., Detroit, manufacturers of varnish, but equally well known as the principal operators of charcoal blast furnaces in Michigan have begun making iron at the old Chocolay furnace at Marquette, and the Boyne City Furnace. To operate the Chocolay plant the Northern Charcoal Iron Co. has been incorporated, and under the direction of Supt. E. E. Johnson of the furnace at Newberry, the furnace is being prepared for activity.

THE ART OF CUTTING METALS[1]

(Continued from last week.)

By Fred W. Taylor.

THE CHEMICAL COMPOSITION OF TOOL STEEL.

The Analyses and Cutting Speeds of the Latest High Speed Tools, and a Comparison of These Tools With Mushet Self-Hardening Tools and the Original High Speed Tools.

The best tool steel should be capable of producing high speed tools of the following qualities or characteristics:

(A) Tools should be of such composition that comparatively small errors or imperfections in the heat treatment will not seriously injure them and thus render them irregular in their cutting speeds. That is, the steel should be of that composition from which it is easy to make uniform tools.

(B) Tools should not fire crack easily from the heat treatment.

(C) Tools should be capable of running at the highest standard speed in cutting either hard, medium, or soft steel; or hard, medium or soft cast iron.

(D) Tools should be difficult to ruin on the grindstone or through overheating in the lathe.

(E) Tools should be tough in the body; i. e., not liable to break in use even when receiving severe jars or blows from the work.

(F) Tools should be capable of taking fine feeds in cutting hard metals with proportionally high cutting speeds as when taking coarse feeds.

(G) Tools should be easy to dress or shape without requiring very high heat.

(H) When injured through use in the lathe, the quality of the tool steel should be such that the injury can be repaired by grinding off as small amount as practicable from the tool.

No tool steel has yet been developed which possesses all these qualities in

[1]Presidential Address, A. S. M. E., 1906.

TABLE 116.—CHEMICAL COMPOSITION AND CUTTING SPEEDS OF BEST HIGH SPEED TOOLS.

Includes noted English, German and American makes experimented on in the summer and fall of 1906; also composition and cutting speeds of some of the best high speed tools before 1906 and on miscellaneous tools typical of various periods from the carbon tool to the present. For chemical composition and physical properties of forgings and angles of tools, see heading of table 118.

	NUMBER OF THE TOOL STEEL	YEAR IN WHICH ANALYSIS WAS MADE	VANADIUM Va	MOLYBDENUM Mo	TUNGSTEN W	CHROMIUM Cr	CARBON C	MANGANESE Mn	SILICON Si	PHOSPHORUS P	SULPHUR S	MEDIUM STEEL FORGING	HARD STEEL FORGING	HARD CAST IRON	
This is the best high speed tool with which we have experimented	1	1906	0.32 0.29		17.81 18.19	5.48 5.47	0.682 0.674	0.07 0.11	0.049 0.043			90 ft. *	41 ft. 6 in.	52 ft.	Both of these analyses make tools of practically the same cutting speed. Forges hard at light cherry red. Should be forged at a light yellow heat, at which heat it forges more readily than the old self-hardening tools.
	2	1906			18.19	3.86	0.736	0.06	0.210			91 ft. *	40 ft.	50 ft.	Rather hard to forge
	3	1906			14.41	3.28	0.709	0.07	0.130				39 ft.	50 ft.	Rather hard to forge
	4	1906			17.61	4.34	0.502	0.10	0.240				38 ft.	49 ft.	Rather hard to forge
	5	1906			14.23	3.44	0.739	0.06	0.165				39 ft. 6 in.	46 ft.	Rather hard to forge
	6	1906			25.43	2.23	0.536	0.29	0.034				39 ft.	47 ft.	Rather hard to forge
	7	1906			14.91	5.71	0.790	0.06	0.060				36 ft. 6 in.	47 ft.	Rather hard to forge
	8	1903		0.48	17.79	2.84	0.650	0.12	0.087	0.013	0.012	70 ft. †	37 ft.	45 ft. 6 in.	Rather hard to forge
	9	1903			19.64	2.85	0.760	0.30	0.090				37 ft.	45 ft. 6 in. †	Rather hard to forge
	10	1903			18.99	2.61	0.670	0.20	0.265	0.014	0.009		37 ft.	45 ft. 6 in. †	Rather hard to forge
	11	1903			23.28	2.80	0.900	0.11	0.165	0.015	0.009		37 ft.	45 ft. 6 in. †	Rather hard to forge
	12	1903		2.03	18.93	3.52	0.580	0.19	0.135	0.029	0.016		37 ft.	45 ft. 6 in. †	Rather hard to forge
	13			4.21	13.44	3.04	0.760	0.09	0.092				37 ft.	45 ft. 6 in. †	Rather hard to forge
	14	1905			24.64	7.02	0.600	0.03	0.305			85 ft. *	38 ft.	44 ft.	Rather hard to forge
	15	1906			19.97	3.88	1.29	0.14	0.220			84 ft. *	38 ft.		Rather hard to forge
	16	1906			19.16	5.61	0.79	low	low			83 ft. *	37 ft.		Rather hard to forge
	17	1906		7.60	9.25	6.11	0.32	0.13	0.081			80 ft. *‡	37 ft.		Rather hard to forge
	18	1906	0.28		16.00	3.50	0.70	low	low				38 ft.		Rather hard to forge
	19	1906			16.00	3.50	0.70	low	low				34 ft.		Rather hard to forge
	20	1903			14.71	2.90	0.700	0.12	0.196	0.017	0.010	64 ft.	34 ft.	44 ft.	Rather hard to forge
	21	1903			15.31	2.88	0.540	0.12	0.133	0.018	0.009		34 ft.	44 ft. †	Rather hard to forge
	22	1903		0.75	14.91	2.80	0.450	0.10	0.090	0.018	0.008		34 ft.	44 ft. †	Rather hard to forge
	23	1903			14.62	2.81	0.600	0.18	0.323	0.017	0.009				Rather hard to forge
	24			6.25		4.30	0.900	0.12	0.491	0.013	0.008				Cutting speeds of these three steels inferior to any of the above
	25				10.68	3.67	1.160	0.10	1.340	0.094	0.008				
Typical Tools of Various Periods from the Carbon Tool to the Present Day															
Jessop Carbon (tempered)	83	1894					1.047	0.189	0.206	0.017	0.017	16 ft.	6 ft.	15 ft. 6 in.	
Mushet (self-hardening) This tool was used by us in our Bethlehem experiments in 1898, referred to below as No. 65	65	1898			5.62	0.49	2.49	1.80	0.711	0.055	0.051	26 ft.	8 ft. 6 in.	28 ft.	
Bethlehem (self-hardening Mush). This tool was used by us in our Bethlehem experiments in 1898, referred to below as No. 27	27	1898			8.40	1.80	1.43	0.23	0.126			63 ft.	19 ft.	39 ft.	This tool was run both upon the 0.43 and 0.34 carbon forgings, referred to in footnote *, and gave cutting speeds of 48 feet and 60 feet, respectively. This tool was analyzed by us in 1906
Bethlehem (self-hardening H S H). This tool was used by us in our Bethlehem experiments in 1898. Same as referred to below as No. 26.	26				8.00	3.80	1.85	0.30	0.15	0.025	0.030	38 ft.	20 ft. 6 in.	43 ft.	This tool was not again analyzed by us in 1906
Two tools of this composition were experimented with in 1906. One of these tools was used in our 1902 experiments, referred to in paragraph 805, and the other in tool steel experiments, made by us at the works of the Link Belt Engineering Co. in 1903. See No. 20 above	20	1903			14.71	2.90	0.70	0.12	0.196	0.017	0.010	64 ft. †	34 ft.	44 ft.	
Same tool used by us in tool steel experiments in works of Link Belt Engineering Co. in 1903. See No. 8 above	8	1903		0.48	17.79	2.84	0.65	0.12	0.087	0.013	0.012	70 ft. †	37 ft.	45 ft. 6 in.	
Tool No. 1 above	1	1906	0.32 0.29		17.81 18.19	5.95 5.47	0.682 0.674	0.07 0.11	0.048 0.043			99 ft. *	41 ft. 6 in.	52 ft.	

*Tools marked thus were actually run in 1906 upon a 0.43 carbon forging which has a standard cutting speed as 48 : 60 compared to the cutting speed of the 0.34 carbon referred to in this column

†Tools marked thus were run on another forging or casting and the cutting speeds given were judged by comparing the qualities of the two forgings or castings and the speeds of the other tools run at the same time

‡Tools marked thus were not run a sufficient number of times in this particular case to be certain of the correct speeds. The figures given are therefore partly estimated

TABLE 117.—CHEMICAL COMPOSITION AND CUTTING SPEEDS OF VARIOUS SELF-HARDENING AND CARBON TOOLS EXPERIMENTED WITH PRIOR TO THE DISCOVERY OF HIGH SPEED TOOLS.

For chemical composition and physical properties of forging and for angles of tools, see heading, table 118.

MARK OF TOOL	SELF-HARDENING TOOLS BEFORE THE DISCOVERY OF THE TAYLOR-WHITE PROCESS:	NUMBER OF THE TOOL STEEL	YEAR IN WHICH ANALYSIS WAS MADE	MOLYBDENUM Mo	TUNGSTEN W	CHROMIUM Cr	CARBON C	MANGANESE Mn	SILICON Si	PHOSPHORUS P	SULPHUR S	MEDIUM HYDR. FORGING STANDARD STEEL NOW TREATED AT A HIGH HEAT	HARD STEEL FORGING	VERY SOFT CAST IRON	
S. S Co.	Mushet Steel	65	1899	4.58	5.62	0.490	2.49	1.90	0.711	0.055	0.051	25 ft. *			
M.S Co.	Atha and Illingworth Self-hardening Steel	66	1899			3.430	1.015	1.45	0.285	0.027	0.016	24 ft. *			Tendency to fire crack
X M	Firth Stirling Co.	67	1902		7.57	0.900	2.300	3.22	0.269	0.019	0.007	24 ft. *			
	Midvale Steel Co.	68	1906		8.48	1.480	1.386	0.32	0.358	0.016	0.022	30 ft. *			
	Sanderson, S. H.	33			6.83	3.940	1.470	0.37	0.770						
	Sanderson Steel	69	1906		4.48	3.985	1.512	0.91	0.253	0.017	0.023	27 ft. *			
0 and 22	Midvale (self-hardening)	70	1894		7.723	1.530	1.143	0.18	0.249	0.023	0.008	25 ft. 6 in. †	10 ft. 11 in.†	80 ft.	Easier to forge than Mushet but liable to injury through overheating without crumbling as Mushet does
00	Mushet (self-hardening)	71	1894		5.441	0.398	2.180	1.578	1.044			25 ft. †	7 ft. 9 in.†	86 ft.	
X	Sanderson (self-hardening)	72	1894		4.037	2.410	1.400	0.254	0.218	0.018	0.006	24 ft. 10 in†	8 ft.†	81 ft.	
I	Jones and Colver (self-hardening)	73	1894		10.721	2.868	1.650	2.235	1.027			21 ft. 6 in. †	6 ft. 10 in		Very hard to forge and brittle in the body
	Bergen Special (self-hardening)	74	1894		7.899	0.574	2.220	3.530	0.630	0.026	0.054				
	Mushet Air hardening Steel, Penna. Steel Co.	75	1903		6.057	0.342	2.213	1.900	0.883	0.037	0.023				
	Stirling Steel Co (self-hardening)	76	1903		8.367	0.254	1.806	1.870	0.156	0.015	0.008				
	Sanderson (self-hardening)	77	1903		7.806	1.464	1.050	2.580	1.094	0.068					
	Sanderson (self-hardening)	78	1903		7.389	0.200	2.179	2.560	0.182	0.016					
	Sanderson (self-hardening)	79	1900		11.589	2.694	1.842	2.430	0.900	0.023	0.007				
	Imperial (self-hardening) Park Bros., Pittsburg	80	1903		6.903	0.678	1.739	2.520	0.250	0.019	0.014				
	Sanderson (self-hardening)	81	1903		7.979	1.328	1.628	2.670	0.978	0.072	0.011				
	Tool Steels which contain either Tungsten or Chromium but which are not even in a small degree Self-Hardening Steels (Must be Hardened in Water)														
P8	Pennsylvania Refining Co.	82	1904		1.842		1.876	0.552	0.286						
	Kirben Steel containing high tungsten but low manganese (not self-hardening)	83	1904		6.67 to 7.03	0.078	1.220	0.200	0.180	0.017	0.010				Must be hardened at a low heat or is likely to be brittle
F and 1 x 1	Midvale Chrome Crucible Steel containing considerable chromium (not self-hardening)	84	1894			1.773 1.631	0.710 0.745	0.102	0.326 0.267	0.016 0.016	0.008 0.013	19 ft. †	7 ft. †	71 ft.	Requires rather low heat for hardening or is in danger of fire cracking
	Ordinary Carbon Tool Steels Hardened in Water														
2 and III	Jessop (tempered)	85	1894		0.079		1.067	0.189	0.206	0.017	0.017	16 ft. †	6 ft.	47 ft. 6 in.	
II	Stirling Special (tempered)	86	1894				1.240	0.186	0.232	0.016	0.006	16 ft. †	5 ft. 11 in.	47 ft.	
IIII	Sanderson (tempered)	87	1894				1.072	0.291	0.148	0.014	0.011	15 ft. 6 in. †		48 ft. 6 in.	
8	Midvale Open Hearth (tempered)	88	1894				0.902	0.315	0.256	0.027	0.020	16 ft. 6 in. †		48 ft.	
XO	(tempered)	89					0.661	0.198	0.219	0.024	0.011			47 ft.	

the highest degree. It is, however, a most interesting and useful fact that the tool steel marked No. 1, table 116, possesses all except two of these qualities in as high a degree as any steel that we have tested. The two defects possessed by this steel are that it is rather difficult to forge into a tool; and although it is very tough in its body, it is not as tough as tools whose bodies are either annealed or partially annealed.

Chemical Analyses and Cutting Speeds of the Best Modern High Speed Tools.

In table 116, we give the chemical composition of various makes of tool steel now in use, and we believe that this list contains the most noted, and as far as we know the best English, German and American brands of high speed tool steels. Opposite each make of tool will be found its standard speed, 20 minutes duration, 3-16 inch depth of cut, 1-16 inch feed, in cutting:

a Medium tool steel about 0.34 per cent carbon, 73,000 pounds tensile strength, 30 per cent stretch;

b very hard annealed tool steel, about 1 per cent carbon, 100,000 pounds tensile strength, 6 per cent stretch; and

c very hard cast iron.

It has been our experience that a tool capable of cutting metal of these three qualities at high speeds is also capable of cutting at correspondingly high speeds almost any other quality of steel or cast iron which is softer than those given. Tools are sometimes found which will cut the very hard metals at high speeds, and yet not do proportionally well on the medium metals; but if they cut both the very hard and the medium, our experience is that they are equally good for anything softer. Many tools can be found however, which cut softer metals well and yet fall down badly in cutting hard steel or hard cast iron.

Recent Comparison of Cutting Speed of Best Modern High Speed Tools With That of Former Typical Tools.

Our objects, then, in making the series of experiments whose results are tabulated in table 116, are, first, that having determined the best steel to use for making modern high speed tools, we might clearly connect this information with practically all of our past experiments (this is important principally for the purpose of modifying all of the laws and formulae obtained by us, so as to bring them completely up to date and make them accord with the tools made from the best tool steel now known), and second, because as an interesting historical fact, they indicate as accurately as practicable the progress made in proceeding step by step from the carbon tools to the best modern high speed tools.

The Best Chemical Composition for Modern High Speed Tools.

By referring to table 116, it will be noted that while No. 1 tool is in all respects better than any of the others, yet the differences in cutting speeds are comparatively small between this tool and several of those following it. Therefore the users of tool steel cannot go far wrong by adopting any one of these noted brands of tool steel, but having once adopted a make of tool steel we would strongly advise against changing, and particularly allowing any other steel to be used in the same shop.

Analyses of Self-Hardening and Ordinary Carbon Tool Steel as Used Before the Discovery of High Speed Tools.

Table 117 affords an interesting study of the relation between the chemical composition of various tool steels and their cutting speeds. Beginning with the analyses of carbon tool steels, by referring to table 117, Nos. 85 to 89, it is apparent that but small differences exist in the cutting speeds of the various makes; in fact, when cutting the same quality of metal, the cutting speeds do not vary more than 6 per cent.

Tools Which are Not Self-Hardening and Yet Contain Tungsten or Chromium.

Analyses Nos. 82 and 84 include several tools which must be hardened and tempered in the old fashioned way to be of any use; and yet to these steels

TABLE 118.—CHEMICAL COMPOSITIONS AND CUTTING SPEEDS OF TOOLS USED IN THE DISCOVERY AND DEVELOPMENT OF THE TAYLOR-WHITE PROCESS OF MAKING HIGH SPEED TOOLS BY HEATING TOOLS CLOSE TO THE MELTING POINT.

Tool used on medium steel forging: clearance angle 6 degrees, back slope 8 degrees, side slope 14 degrees; tool used on hard steel forging and hard cast iron: clearance angle 6 degrees, back slope 5 degrees, side slope 9 degrees. Chemical compositions of forgings as follows: Medium steel forging, carbon 0.34, manganese 0.54, silicon 0.76, phosphorus 0.037, sulphur 0.026; hard steel forging, carbon 1.40, manganese 1.11, silicon 0.305, phosphorus 0.036, sulphur 0.049; hard cast iron, total carbon 3.32, combined carbon 1.12, manganese 0.68, silicon 0.86, phosphorus 0.78, sulphur 0.073. Physical properties of forgings as follows: medium steel forging, tensile strength 70,280 pounds, elastic limit 34,630 pounds, extension 29 per cent contraction 44.34 per cent; hard steel forging, test bars cut from each end of the forging; tensile strength 91,670 and 101,860 pounds, elastic limit 60,090 and 53,980 pounds, extension 7 and 5 per cent, contraction 11.66 and 9.3 per cent, respectively. A study of the various groups of analyses will show the effects of tungsten, chromium, molybdenum, carbon and manganese when used in large or small quantities upon the speeds of Taylor-White treated tools.

	NUMBER OF THE TOOL STEEL	MOLYBDENUM Mo	TUNGSTEN W	CHROMIUM Cr	CARBON C	MANGANESE Mn	SILICON Si	MEDIUM STEEL FORGING: STANDARD SPEED OLD STYLE NOT TREATED T-W PROCESS	MEDIUM STEEL FORGING: STANDARD SPEED TREATED T-W PROCESS	MEDIUM STEEL FORGING: VERY HARD STEEL FORGING TREATED T-W PROCESS	HARD CAST IRON TREATED T-W PROCESS	
Recommended in patent for cutting hard steel	26		8.00	3.80	1.85	0.30	0.150	27 ft.	58 ft.	30 ft. 6 in.	43 ft.	Harder to forge than No. 27.
Recommended in patent for cutting medium and soft metals	27		8.50	2.00	1.85	0.15	0.150	31 ft.	61 ft.	19 ft.	39 ft.	Easy to forge.
	28		8.76	1.75	1.30	0.39	0.395	32 ft. 6 in.	61 ft. 5 in.			
	29		8.38	1.62	1.26	0.31	0.432		60 ft.			
BETTER TOOLS MADE DURING DEVELOPMENT OF TAYLOR-WHITE PROCESS.	30			2.01					60 ft.			
	31		7.89	2.16	0.858	0.47	0.288		61 ft.			
	32		6.50	2.77	1.860	1.19	0.379	32 ft.	61 ft. 3 in.			
	33		6.83	3.94	1.470	0.37	0.770	27 ft.	61 ft. 3 in.			
	34		7.68	3.78	1.810	0.32	0.191	20 ft. 11 in.	57 ft.			
	35		7.94	3.81	1.950	0.41	0.572		59 ft. *			
Recommended in patent for cutting hard steel	26		8.00	3.80	1.85	0.30	0.150	27 ft.	58 ft.			
	34		7.68	3.78	1.81	0.32	0.191	20 ft. 11 in.	57 ft.			
EFFECT OF HIGH CHROMIUM	35		7.94	3.81	1.95	0.41	0.572		59 ft. *			
	33		6.83	3.94	1.47	0.37	0.770	27 ft.	61 ft. 3 in.			
	36		5.48	0.290	2.02	2.25	0.274	25 ft. 6 in.	39 ft. 3 in.			
	37		7.22	0.467	2.40	3.26	0.249	26 ft. 10 in.	37 ft. 9 in.			
EFFECT OF LOW CHROMIUM	38		7.57	0.600	2.30	3.22	0.269	27 ft. 5 in.	37 ft.			
	39		7.18	0.670	2.40	3.44	0.270	20 ft. / 21 ft.	39 ft. 10 in. / 36 ft. 11 in.			
	40		8.58	0.720	0.977	0.39	0.231	20 ft.	50 ft.			
	41		0.83	3.80	1.80	2.19		27 ft.	23 ft.			
EFFECT OF LOW TUNGSTEN	42		1.91	3.25	1.87	0.56		37 ft.	45 ft.			
For effect of high tungsten, see almost all other analyses	43	1.77		1.64	0.89	0.50		45 ft. †	58 ft.			
	44	0.84		2.01	1.02	0.53		27 ft.	35 ft.			
Recommended in patent for cutting hard steel	26		8.00	3.80	1.85	0.30	0.15	27 ft.	58 ft.			
	35		7.94	3.81	1.95	0.41	0.572		59 ft. *			
EFFECT OF HIGH CARBON	45		7.94	1.45	2.44	2.91	0.908		56 ft. *			Hard to forge.
	46		8.05	2.61	2.27	0.42	0.792		57 ft. *			
	32		6.50	2.77	1.86	1.19	0.379	32 ft.	61 ft. 3 in.			
	31		7.89	2.16	0.858	0.47	0.288		61 ft.			
	40		8.58	0.72	0.977	0.39	0.231	20 ft.	50 ft.			
	47		7.87	1.00	1.200	0.41	0.291	30 ft.	50 ft.			
EFFECT OF LOW CARBON	29		8.38	1.62	1.260	0.31	0.432		60 ft.			
	48		3.55	1.91	1.290	0.42	0.235	23 ft. 8 in.	47 ft. 2 in.			
	28		8.76	1.75	1.300	0.39	0.395	32 ft. 6 in.	61 ft. 5 in.			
EFFECT OF HIGH MANGANESE.	45		7.94	1.45	2.44	2.91	0.908		56 ft. *			Hard to forge.
	49		8.61	1.40	1.14	2.38	0.980	22 ft. 6 in.				
	50	4.20		3.95	1.18	0.08			60 ft.			Irregular.
	51		8.15	1.91	1.68	0.12	0.16	32 ft. 6 in.	55 ft.			
EFFECT OF LOW MANGANESE.	52		8.85	1.75	1.54	0.13	0.09					
	53		8.41	3.29	1.54	0.24	0.32	25 ft.	50 ft. 6 in.			
	54	3.67		3.86	1.84	0.30	0.23	27 ft. 6 in.	60 ft.			Irregular.
	34		7.68	3.78	1.81	0.32	0.191	20 ft. 11 in.	57 ft.			
	33		6.83	3.94	1.47	0.37	0.770	27 ft.	61 ft. 3 in.			
	55	0.56			1.05	0.20	0.120	16 ft. 10 in.				
	56	0.84		2.01	1.02	0.53		27 ft.	35 ft.			
	57	0.94			1.07	0.20	0.15	21 ft. 10 in.				
	43	1.77		1.64	0.89	0.50		45 ft. †	58 ft.			
	58	2.03	4.53	2.03	2.02	1.69	0.282	31 ft. / 36 ft.	58 ft. 4 in. / 58 ft. 4 in.			Tendency to fire-crack.
MOLYBDENUM SUBSTITUTED FOR TUNGSTEN	59	2.25	4.74	2.80	2.07	1.66	0.120	36 ft.	58 ft. 4 in.			Tendency to fire-crack.
	60	2.45		3.19	1.22	0.66	0.240	30 ft.	50 ft.			
	54	3.67		3.86	1.84	0.30	0.230	27 ft. 6 in.	60 ft.			Irregular.
	50	4.20		3.95	1.18	0.08			60 ft.			Irregular.
	61	4.58		3.43	1.61	1.65	0.285		59 ft.			Brittle in body and fire-cracks easily
	62	4.59		3.46	1.51	1.62	0.245	45 ft. 3 in.				Brittle in body and fire-cracks easily
	63	4.60		3.75	1.84	1.79	0.156	45 ft.				Brittle in body and fire-cracks easily
TO TEST ANNEALING QUALITIES	51		8.15	1.91	1.68	0.12	0.16	32 ft. 6 in.	55 ft.			Annealed readily.
	52		8.85	1.75	1.54	0.13	0.09					Annealed readily.

*Tools marked thus. The record of their cutting speeds could not be found. Speeds given from memory.
†Tools marked thus were run on another forging or casting and the cutting speeds given were judged by comparing the qualities of the two forgings or castings and the speeds of the other tools run at the same time.

have been added the two metals which when combined in sufficient quantities produce self-hardening tools. A study of the chemical compositions of these steels is chiefly interesting for two reasons:

First, because they illustrate the fact that the presence of tungsten even to the extent of 7 per cent as in the case of No. 83 (the Eicken) produces a tool which has no more self-hardening properties than ordinary carbon steel, the reason for this being that there is but an exceedingly small amount of either manganese or chromium present; and also that, as in the case of No. 84 (Midvale chrome-crucible), a tool may contain 1.6 per

cent of chromium (an ample percentage to make good self-hardening steel if either tungsten or molybdenum were present) and still have no self-hardening properties.

Second, because they show clearly that the addition of 1.6 per cent of chromium coupled with 0.71 per cent of carbon (a very low carbon for a tempered tool steel) and also with 0.10 per cent manganese (a decidedly low manganese for a tempered tool steel) gives the tool a materially higher cutting speed than that of the ordinary carbon tempered tools.

We made a very exhaustive examination of this steel, but the fact that it required more skill on the part of the blacksmith in judging its proper hardening heat than the ordinary carbon tools prevented its adoption as a standard shop tool, even although tools of this composition could be run at a cutting speed materially higher than the carbon tempered tools. The cutting speed of these tools was about halfway between that of the carbon and the self-hardening tools; but if heated a little too high they were apt to fire-crack in hardening, and our experience with fire cracks in tools leads to the conclusion that great damage is likely to be done through their breaking in daily use. Therefore when a steel, either carbon, self-hardening, or of the modern high speed tool variety, shows any marked tendency to fire-crack or toward brittleness, we promptly abandon all idea of its adoption as standard. The writer calls attention to this fact chiefly because later, in considering the more important question of the proper chemical composition for high speed tools, it will be observed that many tools whose cutting speeds and other qualities entitle them to consideration were promptly abandoned because they showed a marked tendency toward fire-cracking or brittleness.

However, the steel represented in analysis 83 excels in one respect all carbon steels which have come to our attention. It is admirably suited to finishing extremely hard metals, and, in spite of its requiring a low hardening heat, is an excellent standard for this special purpose.

In table 117, Nos. 65 to 81, we give the analyses of several self-hardening tools made between the dates of 1893 and 1898; and of these, Nos. 65, 66, 67, 68 and 33, were experimented with by us at the Bethlehem Steel Co. just prior to the discovery of the Taylor-White process while searching for the best self-hardening steel to adopt as a shop standard for that company. Many other brands of self-hardening tools had been tested previously by us as to their cutting speeds but because of evident inferiority to the above brands were not analyzed or tested at this time. These five makes of tool steel, then, are interesting because they represent, so far as we know the best self-hardening steels then in the market, and the only makes which we believed to be worthy the expenditure of time and money required in making careful standard speed tests on the experimental lathe. It is notable that two steels out of the five (Mushet and Firth-Stirling) depended for their self-hardening properties upon a comparatively large percentage of manganese in combination with tungsten, while three of them depended mainly upon high chromium in combination with tungsten or molybdenum. It will be observed that No. 68 (Midvale) gave the highest cutting speed, but this steel was seriously injured in the operation of heating by the blacksmith, which injury led to the discovery of the Taylor-White process. It is highly likely, therefore, that had not the high speed tools been discovered, the Mushet self-hardening steel No. 68 would have been adopted by us as our standard in spite of the slightly higher cutting speed of the Midvale steel, since as explained, the Mushet steel gave evidence of overheating by the blacksmith through crumbling when hammered. Thus the Mushet tools, when injured by overheating, remained in the blacksmith shop, while overheated Midvale tools were likely to get into the machine shop and interfere seriously with the uniformity in the shop tools.

In table 118 are given the chemical compositions of various steels experimented with by us during the time of the discovery and development of the new high speed tools by Mr. White and the writer. These tools are separated into various groups for the purpose of showing the relative effect of comparatively large and small quantities of each of the following elements upon the cutting speed; namely, tungsten, molybdenum, chromium, carbon, and manganese.

After the columns giving the percentages of the various ingredients of which the tools are composed, two columns are found, in the first of which is entered the cutting speed of the steel when given the ordinary heat treatment as practiced before our invention, and as in many cases recommended and even superintended by the makers of the tool steel. In the second column are entered the speeds obtained by the same tools after having been treated carefully by the Taylor-White process of heating the tool close to the melting point, cooling it and then reheating it to about 1,150 degrees Fahr.

A study of the various groups of tools together with their cutting speeds before and after receiving the high heat treatment will make clear the basis of our claim that tools containing one-half of one per cent or more of chromium and one per cent or more of tungsten, or its equivalent in molybdenum, are materially improved in cutting speed through the treatment by the Taylor-White process. This, however, is of minor interest. A subject of greater interest is the effect of the various elements when used in such quantities in the tool steel as to produce tools of the highest cutting speeds; that is, the highest degree of red hardness, when treated by the Taylor-White process.

Effect of Tungsten, Chromium, Carbon, Molybdenum, Manganese and Silicon Upon High Speed Tools as Originally Developed.

By examining the chemical compositions of the tools given after Nos. 26 to 35 (namely, the groups of tools which after receiving the Taylor-White treatment gave the highest cutting speeds during the period of our invention), it will be noted, first, that no tool in this group contains less than 6½ per cent of tungsten and that the highest tungsten in this group is 8.75 per cent; second, that no tool in this group contains less than 1.62 per cent of chromium, and that the highest chromium is 3.94 per cent. It would seem, therefore (as a result of these investigations), that to produce what we considered at that time first class tools, the chromium and tungsten must be within these limits.

The effect of low tungsten will be seen by examining tools Nos. 41 to 44. In No 42 it will be noted that with 1.91 per cent of tungsten and 3.25 per cent of chromium, a tool was produced which improved materially upon being heated to a high heat, whereas tool No. 41 containing 0.83 per cent of tungsten and 3.80 per cent of chromium deteriorated materially in its cutting speed upon receiving the high heat treatment. From this it is evident that even with high chromium more than 0.83 per cent of tungsten is required in the tool before the property of red hardness begins to be apparent, and also that high chromium tools are injured in their cutting speeds when overheated, although of course not to same extent as ordinary carbon tools.

On the other hand, upon examin-

ing the carbon column we note that the lowest carbon which produced a first-class tool was 0.858 per cent while the highest carbon was 1.950 per cent. Between these limits, then, our experiments indicated that, as far as the effect of cutting speed was concerned, it was a matter of indifference whether low or high carbon was used. And it is a notable fact that many of the best high speed tools developed up to the present date contain carbon, in almost the same percentage as that indicated by the low limit in our experiments.

At the time that we were developing our invention it was not usual to make self-hardening steel containing carbon in as small quantities as 0.86 per cent. An increase of carbon produces an increase in the hardness of a self-hardening tool, although, as indicated by the group of tools from No. 26 to No. 32, increasing carbon beyond 0.86 per cent does not produce a higher cutting speed or a greater degree of red hardness which is the distinctive quality of high speed tools. We had the 0.86 per cent carbon steel made especially for the purpose of testing the effects of low carbon upon red hardness in Taylor-White treated tools. And it was the statement made in our patent, that high heat treated tools containing 0.86 per cent of carbon gave as high cutting speeds as those containing high percentages of carbon, which first turned the attention of makers of tool steel in this direction.

Our adoption of the higher limits of carbon at the time of the writing of the Taylor-White patent was upon the supposition that through heating the tool many times in succession to the high heat, the carbon lying in the outer layers of the nose of the tool might be considerably reduced, and that with high carbon this reduction of carbon would leave the tool as efficient as ever, whereas with carbon as low as 0.86 per cent any material reduction in carbon might affect its cutting speed.

However, more recent experiments have shown that even with comparatively low carbon there is little danger of injuring the tool so that it cannot be repeatedly heated to the high heat from oxidation or burning out of the carbon in the outer layers of the tool; and in the best of the present high speed tools the rather low carbon of 0.68 per cent is used for the purpose of rendering the steel more readily forged to the proper shape, and also to make it rather less brittle in the body of the tool.

Referring to the manganese column, it is notable that the lowest manganese is 0.07 per cent and the highest 1.19 per cent. It is clear then that low manganese does not affect the property of red hardness in high speed tools. Low manganese renders the tool stronger in its body, less liable to brittleness, less liable to fire crack, and more easily forged and annealed; and for this reason we recommended a steel low in manganese as best for the Taylor-White treated tools.

By examining table 118, the three groups of analyses, namely, the effect of high chromium and the effect of low chromium and the effect of low manganese, it will be noted that making a tool of high chromium with the proper amount of tungsten invariably produces a high speed tool even although the manganese is low; but that a tool without chromium or with very low chromium, even though there is a proper percentage of tungsten present, does not produce a high speed tool even though the manganese may be low or very high. From this it follows that chromium is the element which in combination with tungsten produces the new quality of red hardness and not manganese.

Molybdenum as a Substitute for Tungsten in High Speed Tools.

Mr. White and the writer stated in our patent that molybdenum can be substituted for tungsten in modern high speed tools, and that one part of molybdenum will produce approximately the same effect as two parts of tungsten. We also stated that molybdenum is not as satisfactory an element as tungsten to use in high speed tools. The writer would repeat these assertions as giving our views at the present day upon the use of molybdenum in high speed steels.

By referring to table 118, under the head of "Molybdenum substituted for tungsten" to the tools Nos. 55 (at the top of the list), to 63 inclusive (at the bottom of the list), it will be noted that, particularly in the case of tools Nos. 43, 54, 50 and 61, molybdenum tools having high cutting speeds were experimented with during the development of the Taylor-White process, and that from 4 per cent to 4½ per cent of molybdenum appeared to be a sufficient quantity to make a high speed tool; whereas about 8 per cent of tungsten was required for this purpose. However, by noting our remarks made after most of these tools, it will be seen that they were brittle, had a tendency to fire crack, were weak in the body of the tool, or else they were irregular in their cutting speeds. All of these faults are most serious in their nature, and they were at that time and are still regarded by us as so serious that when a tool clearly develops any one of these troubles we at once cease experimenting with it as not worthy of consideration among first-class tools.

The irregularity in molybdenum tools constitutes perhaps its most characteristic feature. By irregularity we mean that tools of the same chemical composition, and apparently treated alike, give large variations in cutting speed. We have as yet been unable to determine with certainty the cause for the irregularity existing in molybdenum tools. One explanation, however, for this trouble may lie in the fact that molybdenum tools appear to run at their highest cutting speeds when given a high heat slightly lower than the high heat required to produce a first-class tungsten-chromium tool. It may be that when the molybdenum tool is heated beyond that precise high heat which is necessary to make a first-class tool, it deteriorates.

One of the most useful characteristics in the modern tungsten-chromium high speed tool is that it requires little or no skill on the part of the blacksmith to heat it up close to the melting point, and that the tool itself shows clearly by its appearance when its high heat has been reached. Moreover, it is impossible to injure the cutting properties of these tools even if they are heated to a point at which the thinner or sharper edges begin to melt. The difficulty of judging by the eye an exact high temperature reached by a tool when close to or at its melting point is so great that if a definite treating temperature were required at these very high heats—that is, if tools were injured by heating beyond this temperature,—much of the value of the high speed tools would be lost.

Now, as stated, it appears likely that the irregularity in molybdenum tools may be largely due to the fact that a more accurate degree of high heat, considerably below their melting point, is required for them, and that this temperature must be closely judged by the eye of the smith, while no accurate judgment is required for the tungsten-chromium tools, because the tools themselves show when they are close to the melting point; and close to or at the melting point is the temperature which produces a tool giving the highest cutting speeds.

Best Modern High Speed Tools Compared With Original High Speed Tools Developed.

It will be a matter of interest to compare the various properties and chemical compositions of high speed tools as developed by us at the time that our patent was written with those of the best of the high speed tools that have been made up to the pres-

ent time. Tools Nos. 26 and 27, table 118, are those recommended in our patent. By referrig to their speeds in cutting, on the one hand, a medium steel, and on the other hand, very hard steel and hard cast iron, it will be seen that tool No. 26 gave the higher cutting speeds on hard steel and cast iron, while tool No. 27 gave the higher cutting speeds upon medium and soft steels. Thus, at the time of the writing of our patent, in order that a machine shop should have the best tool equipment it was necessary that tools made of two different chemical compositions be maintained as standards.

Referring now to tool No. 1, the best high speed tool experimented with by us in 1906, it will be noted that it has a higher cutting speed upon all the qualities of metal experimented with than any other tool. One of the gains, made by the latest high speed tools lies in the fact that in one tool steel are combined all of the most desirable properties, and therefore only one need be adopted in a shop as standard.

We have referred to red hardness as the distinctive property of modern high speed tools, and in Fig. 115, we showed a photograph of a tool possessing in a high degree red hardness, while at the same time it is so soft that it has been readily filed after running successfully at very high speed. Now while red hardness is the most important property or quality sought for in high speed tools nevertheless, for certain classes of work, namely, turning the very hard qualities of steel and also hard cast iron, the property of hardness is desirable in addition to that of red hardness. The principal difference between tools Nos. 26 and 27 is that the former combines the quality of red hardness with hardness, while the latter lacks somewhat the quality of hardness, although it possesses red hardness in a higher degree than No. 26. The reason, then, that No. 26 cuts hard steel and hard cast iron at so much higher cutting speed than No. 27 is due to the fact that it adds the quality of hardness to that of red hardness. It must be borne in mind, however, that in the average machine shop more than nine-tenths of the work is done upon the medium or softer qualities of metal. Therefore, it is only upon a comparatively small class of work that the quality of great hardness needs to be added to that of red hardness in high speed tools.

One property in which tools Nos. 26 and 27 were both lacking was that, although in cutting soft metals they made the same proportionate gains in cutting speed when taking the fine feeds as when taking the coarser feeds still when these tools were cutting steel of even medium hardness, but slightly higher cutting speed could be used with a feed finer than 1-16 inch than could be taken with a feed of 1-16 inch. This presented a really serious defect in our high speed tools because the greater portion of the feeds taken in the machine shops are finer than 1-16 inch.

Tools of the chemical composition of No. 1 were proved in our recent experiments (1906) to be capable of making the same proportionate gain in cutting very hard metals with fine feeds as they made when cutting soft metals with fine feeds. This then represents a second feature in which the latest high speed tools are better than those originally developed; and this property is also due to the fact that the latest tool possesses a high degree of hardness in addition to its very extraordinary degree of red hardness. In the quality of hardness, however, it will be noted that tool No. 1 does not outstrip its nearest competitors to the same extent as it does in its extraordinary quality of red hardness, the gain in cutting medium steel being proportionally larger than the gain in cutting hard metals. The third feature in which tool No. 1 is superior to tools No. 26 and 27 is that it is stronger in the body.

By far the most important improvement, however, in No. 1 tool over the original tools Nos. 26 and 27 (a matter which the writer looks upon as of even greater importance than the 50 per cent increase in cutting speed) is the fact that it is much more difficult to injure No. 1 tool through carelessness in heating upon the grindstone or through overheating in the lathe under the cut than the original high speed tools. The No. 1 tool will stand a surprising amount of overheating on the grindstone without very serious deterioration; whereas Nos. 26 and 27 were exceedingly sensitive to this bad treatment, and perhaps to this cause more than any other is to be attributed the great lack of uniformity in high speed tools which existed in the early years of their adoption. For this reason, then, No. 1 tool marks a most important advance in maintaining the all important quality of uniformity.

In our patent and in writing this paper we have referred to the good effects resulting from the second or low heat treatment. The percentage of increase in cutting speed due to the second or low heat treatment was more marked in the case of our original high speed tools Nos. 26 and 27, table 118, than it is in the case of our latest high speed tool, No. 1. With the original high speed tools in many cases our low heat or second treatment resulted in a gain in cutting speed of as much as 30 per cent while in tools of the type of No. 1, the second treatment rarely resulted in a gain of more than 10 per cent and frequently even not so large a percentage as this.

On the whole, we look upon this as a very great improvement in the latest high speed tools over the original, because even if the new tools are not given the second or low heat treatment at all, still they will be far more nearly uniform than the original tools of this class. Moreover among those who are using the process of making high speed tools, by heating tools close to their melting point but very few have used in the past or are now using the second or low heat treatment except in as far as this treatment is given to the tool through heating it incidentally or accidentally upon the grindstone or through heating it under the pressure of the chip in the lathe. The only feature in which tool No. 1 is less desirable than tools Nos. 26 and 27 is that it is more difficult to forge, at the old forging heats, namely about a light cherry red.

We have already pointed out that the substitution of chromium for manganese in both the old self-hardening steels and in the high speed steels allows the tool to be forged at a heat very considerably higher than the light cherry red without danger of crumbling. In other words, the addition of the chromium and the absence of manganese render the tool just the opposite of what is called "red short;" that is, just the opposite of a liability to crumble when struck with a hammer at a high heat.

It will be noted that tool No. 1 contains from 5½ per cent to 6 per cent of chromium, and this increased percentage of chromium has the very useful effect of allowing the tool to be forged at an exceedingly high heat, in fact, not very far below the melting point. The danger of injuring the tool through oxidization at this extremely high heat is great, however, and we therefore recommend as a forging temperature a light yellow heat. When tools containing 5½ per cent to 6 per cent of chromium and of the general chemical composition of No. 1 tool are heated to this light yellow heat they are much easier to forge even than the original high speed tools, Nos. 26 and 27, and also easier to forge than such of the tools as lie between Nos. 2 and 23, and which contain less

than 5 per cent of chromium. This is an added and a great advantage of No. 1 tool over the other modern high speed tools. Tools of the composition of No. 1, then, should be forged at a light yellow heat.

To recapitulate, the improvement in the latest high speed tools over the original high speed tool consists in:

(A) Far greater uniformity, owing to less danger in being injured in grinding and in daily use.

(B) 50 per cent increase in cutting speed.

(C) The attainment of almost its maximum cutting speed without the necessity of the second or low heat treatment.

(D) The combination in the same tool of the highest degree of red hardness with a high degree of hardness, thus requiring only one standard high speed tool steel in the shop.

(E) The ability, owing to increased hardness, coupled with the necessary red hardness, to make the same proportionate gain when cutting with fine feeds upon hard metals as upon soft.

(F) Greater strength in the body.

The only point of inferiority is increased difficulty in forging at a cherry red, and if blacksmiths are taught to forge their tools at a light yellow heat, these tools are easier to forge than the original high speed tools.

We have referred to the fact that since writing our patent no improvement whatever has been made in the heat treatment of high speed lathe and planer tools. The all-round gain in the No. 1 tool over the original high speed tool, then, lies entirely in a change in chemical composition. It would seem therefore a matter of interest to point out the change in the composition of these tools, and, so far as practicable, to indicate the cause and effect of the change in each of the improved elements.

Principal Chemical Changes Made in Best Modern High Speed Tool Over Original High Speed Tool.

Our patent, describing the original high speed tool, claims, briefly speaking, the combination of one-half of one per cent of chromium, or more, with one per cent of tungsten, or more; the tool to be treated to the high heat, etc. In our patent we also state that, practically speaking, the best tools developed by us at that time contained 2.00 per cent to 3.80 per cent of chromium instead of 0.5 per cent of chromium, and 8.00 to 8.50 per cent of tungsten instead of 1.00 per cent of tungsten.

The principal chemical change which has taken place in the best high speed tools up to the present time has been to still further increase the percentage of chromium, so that instead of containing 3.80 per cent as recommended by us, the tools now contain from 5.50 per cent to 6 per cent and to still further increase the tungsten from 8.50 per cent to from 18.0 per cent to 19.0 per cent. This large increase in the percentage of chromium and tungsten has produced the material increase of 50 per cent in the red hardness of the tool and at the same time, also, a material increase in the hardness over our original high speed tool No. 27. It is notable, however, that if the percentage of tungsten is increased much beyond 19.0 per cent even although the chromium is also increased in quantity, that the tool diminishes in red hardness. This fact will be noted by comparing the cutting speeds of No. 14 tool (which contains 24.64 per cent of tungsten and 7.02 per cent of chromium) with the cutting speed and chemical composition of No. 1 tool; and the metal close to the cutting edges of tools containing these very large percentages of tungsten and chromium appear to yield, or become slightly deformed, particularly when cutting the thinner shavings or chips.

The presence of high manganese in a tool and also the presence of high carbon, both tend to increase the hardness of the tool. They make the tool more brittle in the body; and in addition, high manganese causes the tool to crumble in forging when heated much beyond a bright cherry red. It was for this reason that we, in our original Taylor-White tools, specified low manganese (0.15 per cent); and this has been adopted as a characteristic in all the modern high speed tools.

The tools as recommended in our patent contained carbon to the extent of 1.85 per cent, and this element has been lowered in modern high speed tools largely as a result of the fact pointed out by us in our patent, that the quality of red hardness is not materially affected by either high carbon or carbon as low as 0.86 per cent. If either high manganese or high carbon (as much as 1.85 per cent) were used in a tool in combination with 5½ per cent of chromium and 19.0 per cent of tungsten, the tool would be brittle in the body and exceedingly difficult to forge; and the presence of high manganese particularly would tend to reduce rather than to increase its red hardness. Therefore, the latest high speed tools contain manganese in as small quantities as is practicable when the expense of the mixture and the needs in melting are considered.

Modern high speed tools have been recently experimented with by us containing carbon varying from the small amount of 0.32 per cent to the higher percentage of 1.28; and our conclusion from these experiments is that the property of "red hardness" in the modern high speed tools is not noticeably affected by either high or low carbon within these limits. The quality of hardness, however, in the tool is affected by the percentage of carbon and, as previously explained, a certain degree of hardness is required as a property in high speed tools for several reasons.

The carbon contents of the modern high-speed tools, then, would seem to be governed by a compromise between the two requirements: on the one hand, higher carbon is needed to produce a greater degree of hardness in the tool; and, on the other hand, lower carbon is needed to make the tool more readily forged and also to make it stronger and tougher in the body.

As indicated in table 116, analysis of tool No. 1, the best tool experimented with by us contained 0.68 per cent carbon, and we recommend for a modern high-speed tool not less than one-half of one per cent (0.5 per cent).

There is one element of less importance than those previously considered which nevertheless should receive attention. The statement has been published several times that high silicon tended toward higher cutting speeds in high-speed tools. In developing our patent, we experimented quite thoroughly with this element, and arrived at the conclusion that high silicon tended toward slower cutting speeds, particularly when cutting the harder metals. In our patent, therefore, we recommended the low silicon, 0.15 per cent, and it will be noted that, on the whole, low silicon is a characteristic of most modern high-speed tools.

Our experiments indicate that high phosphorus and sulphur are much less injurious to high-speed tools than they were to the carbon tools. However, these elements still exert a somewhat injurious influence upon the steel, and we therefore recommend, inasmuch as the presence of chromium and tungsten in large quantities necessarily render high-speed tools very expensive, that the best qualities of low phosphorus and low sulphur iron should be used in their manufacture.

Discovery that Small Quantities of Vanadium Improve High-Speed Tools.

No manufacturer of tool steel needs to be informed that the chemical analysis of steel (at least those analyses which are ordinarily made in our

best chemical laboratories) is not alone a true or infallible guide to the real quality of steel. There are other factors than the elements which are ordinarily determined in laboratories which affect the quality of the tool steel.

We all know that to obtain the best quality of tool steel, the mixture must be melted just right. The melting must be thorough and complete in order to bring about the proper alloying of the tungsten and chromium with the iron and carbon without at the same time oxidizing the bath. In addition to this, the metal must be poured or "teemed" in the right way in the molds, and the ingots must be made of the best size and shape for the subsequent operation of hammering the steel. The steel itself must be also carefully heated and handled during the operation of hammering. All of these elements affect the quality of the steel as well as the chemical composition.

An examination of the tools between No. 1 and No. 19 in table 116, will illustrate this fact, i. e., that something other than the chemical composition modifies the cutting speed of these tools. This will be particularly noted by comparing the analysis of tool No. 3 with that of tool No. 5. These steels chemically resemble each other very closely, and yet No. 3 has a distinctly better cutting speed than No. 5.

Perhaps the most important of these collateral elements or influences affecting the quality of tool steel, however, is that of the melting and pouring or teeming of the ingot in such a way as to remove as far as possible those chemical impurities which are not indicated by the ordinary chemical analyses; and of these impurities we believe that the more obscure oxides constitute the worst enemies of steel. The term "good melting" might be translated into more scientific language by saying that the steel should be so carefully mixed and melted as to contain the minimum quantity of these injurious oxides. There have been various expedients adopted by makers of tool steel to secure this end, and some of these are still held more or less as trade secrets. It is our belief, however, that we have discovered during the last year perhaps the most efficacious remedy for "bad melting" that has yet been devised. We refer to the use of vanadium, a metal comparatively new in the art of practical steel manufacture. Mr. James M. Gledhill, in his paper on "The Development and Use of High-Speed Tool Steels" published in the "Journal of the Iron and Steel Institute," in 1904 speaks of having substituted vanadium for chromium in high-speed tools, and he states that while the vanadium when used in cutting a steel of medium hardness stood well, yet it did not do better than tools containing the element of chromium.

Our experiments indicate the fact that vanadium should not be substituted for chromium, but that a minute quantity of vanadium should be added to the mixture in melting, and that its use to the extent of from 0.15 per cent to 0.35 per cent is as effective as higher quantities in the mixture. Our experiments would indicate the probability that the good effects of vanadium are derived from its chemical property as a cleanser of the steel during the operation of melting rather than as a very valuable property in the steel after it is melted. From 0.15 per cent to 0.30 per cent of vanadium when mixed with the steel in the pot sometimes disappears entirely from the finished steel, and its presence cannot be found by analysis, indicating that it has probably joined with some other element or elements, and gone off into the slag. It is likely then that minute quantities of vanadium act as cleansers of the bath, uniting with some of the obscure oxides and carrying them off into the slag. We know, for example, that the shop in which No. 1 tool was made is not run with the exceptional skill of long experience, and yet in this shop the addition of small quantities of vanadium very materially improves the cutting properties of the tool.

An illustration of this fact will be seen by comparing steel No. 18 with steel No. 19; these two steels being practically the same chemical composition except that one of them has had a small amount of vanadium added to it. These examples of steel were made in the melting shop above referred to.

To close the subject of the chemical composition for high-speed tools, we do not wish to give the impression that we believe that No. 1 tool represents the chemical composition of the best tool which will ever be made. On the contrary, we believe that the improvement in the proper combination of the various elements required to make a high-speed tool will continue, and it is a matter of surprise to us that greater improvement has not been made since our original discovery of high-speed tools. Manifestly, it is highly desirable that a mixture should be found for high-speed tools which shall be much more economical than any of the mixtures now used; and we believe that in the future this result will be brought about. It would seem as though this represents perhaps the most important field for the future economical development of the high-speed tool.

(To be continued.)

IMPROVEMENTS OF THE PENNSYLVANIA ENGINEERING WORKS.

Many improvements and extensions are being made by the Pennsylvania Engineering Works, New Castle, Pa., which will cost a large sum of money and add greatly to the producing capacity of the plant. The most important of these is a new crane runway 330 feet long, 60 feet span, 36 feet to top of rails and designed for 30-ton cranes. Although not enclosed on one side, this runway will be entirely roofed over and will be used for the storage of all raw material to be used in the boiler, smith and machine shops,—such as plates, steel castings, iron castings and forging blooms. The location of this runway is such that three tracks run into it, so that it is possible to unload six cars of incoming material without making a shift. By carrying the unfinished material under this runway the production of all the finishing departments will be greatly increased, as all incoming material has been carried inside heretofore, thus occupying a large percentage of valuable floor space.

Another important addition is the extension to the machine shop, which adds 25 per cent to its size and will permit of more machine tools being added from time to time.

The pattern shop, which has occupied one gallery of the machine shop, is being moved into the building recently purchased from the Edwin Bell Co. and used by it as a keg factory. This building is 60 by 125 feet, two stories, with a lean-to 40 by 90 feet, and an annex 64 by 75 feet. The pattern makers will occupy the annex, the carpenters the lean-to, while the main building will be used as a pattern store house.

The company also has plans out for a splendid office building, 80 by 50 feet 6 inches, of fireproof construction. This building will be located on Nut street, 170 feet back from Jefferson street and directly across from the machine shop. One feature of the office worthy of special note is the vault which is 11 by 25 feet inside and will be three stories high, having one entrance in the basement, one from the general office on the first floor and one from the drawing room on the second floor. The electric blue printing department is located in a special room on the roof.

The plant is well supplied with orders at the present time and anticipates a steady run for the year.

RED IRON ORES

Of the Birmingham, Ala., District.—Red Hematite Mixed With Lime and Silica.

Since 1894 Alabama has held third place among the iron producing states. As the Birmingham district produced in 1905, 2,561,264 tons of red hematite, or 86.7 per cent of the total tonnage of the state, particular interest attaches to a study of the Clinton, or red ores of the district, which Mr. Ernest F. Burchard of the United States Geological Survey carried on last summer.

By the Birmingham district is meant the area from which the furnaces at Birmingham, Ensley, and Bessemer derive their iron ores. It is comprised within the southeast half of the Birmingham 30-minute quadrangle, together with the northwest quarter of the Bessemer quadrangle, and the northeast corner of the Brookwood quadrangle.

The city of Birmingham and its suburbs are built in the heart of the valley region of Alabama. This valley region lies between the Cahaba coal field on the southeast and the Warrior coal field on the northwest. Its rectilinear ridge and valley type of topography is strongly contrasted with the irregular, roughly dissected topography of the coal fields.

The Birmingham valley, the largest and, from an industrial standpoint, the most important of these valleys, has a length of nearly 75 miles, an average width of more than 6 miles, and an area of nearly 500 square miles. This valley is divided into minor valleys by low ridges.

Red Mountain, the main minor ridge within the Birmingham valley, furnishes nearly all the red ore smelted in the district, while the Woodstock area, in the southwest part of the valley, produces the major part of the brown ore. Coking coal is mined in the Warrior coal field only a few miles distant from the furnaces. Dolomite and limestone suitable for fluxing, occur in the valley rocks below and above the red ore. Only in the southern Appalachian iron ore district is there grouped such a series of deposits, each member of which is more or less dependent upon the others, but which when taken together form such a matchless combination of raw materials. The simple, regular, topographic features of the valley have made accessible the ores and stone at every point where they are of workable character, and enterprising railroad companies have fast improved the opportunities for developing the region. The only serious problem involved by the valley topography is that of obtaining a water supply adequate for manufacturing purposes. That there will be no difficulty about this, if another large aqueduct is built from Cahaba river, is assured.

Red ore occurs in practically all the outcrop areas of the Rockwood formation, but only in Red Mountain has it been found of sufficient thickness and purity to be worked on an important scale. The workability of the ore depends largely upon the attitude of the inclosing strata. The beds of Red Mountain dip southeastward at moderate angles, which are usually fairly constant for the distance of a mile or more along the strike.

The ores consist essentially of red hematite intimately mixed with varying percentages of lime and silica. According as the ore is high or low in lime it is termed "hard" or "soft" ore. While the soft ore carries a higher percentage of iron, the hard ore has the advantage of containing almost enough or, in places, enough lime to flux the silica which it contains.

The Rockwood, or "Red Mountain" formation in which the ores occur is extremely variable in thickness and in the details of its stratigraphy. The presence of beds of hematite somewhere within the formation is, however, a remarkable persistent feature, not only throughout the whole length of the Appalachians, but in rocks of equivalent age in Wisconsin and New Brunswick.

Mining conditions at present are doubtless at their most favorable stage. In the summer of 1906 there were no less than 33 mines actively producing red ore in the district, besides seven or eight workings which have been inactive since the soft ore was exhausted from them.

In July, 1906, the deepest slope in Red Mountain was reported to be 2,100 feet long. No deterioration in either quality or thickness of the hard ore in the direction of dip has yet been disclosed by the deeper slopes.

Campbell Fourth Edition. — The fourth edition of the monumental work "The Manufacture and Properties of Iron and Steel," by Harry Huse Campbell, metallurgical engineer for the Pennsylvania Steel Co., the Maryland Steel Co. and the Spanish American Iron Co., has just been issued. The new volume consists of 640 pages and is sold by The Penton Publishing Co. for $5. In the preface to the fourth edition, Mr. Campbell explains that by constant additions the book has grown too big to be convenient, and that hence he went over every line to eliminate unnecessary phrases and words. On the other hand, much new matter has been added and in many places new knowledge has been introduced. A review of this new edition will appear in an early issue of THE IRON TRADE REVIEW.

TEXT BOOK ERRORS

Pointed Out by Mr. Outerbridge.—Also Mistakes of Foundrymen.

Alexander E. Outerbridge Jr., in a paper read before the Pittsburg Foundrymen's Association, April 1, on "Fluxes and Alloys," expressed the belief that fluxing iron in a cupola has but little effect upon chemical changes. "What, then," he asked, "is the true function of fluxing of a cupola? My reply is that fluxing with limestone, oyster shells, fluorspar, etc., is useful mainly for the purpose of making a more fluid slag, thus preventing the slag, formed from the non-metallic substances, such as ash, sand, scoria, iron oxide, etc., from clogging the cupola when the bottom is dropped, or from becoming mechanically caught in the molten iron as it escapes from the spout. A thick pasty slag presages dull iron and dirty castings. Fluorspar makes an extremely fluid slag and is therein beneficial, but unfortunately, it also has a destructive action on ordinary cupola linings, and should be used cautiously on this account. The claim that fluorspar exerts any other beneficial influence on the molten iron, lacks confirmation from analyses.

Using No Flux.

"There does not appear to be any established rule or custom among foundrymen regarding the proper quantity of flux, or the best method of charging it in the cupola in order to obtain economically the best results; the proportion of flux to iron melted varies all the way from 1 to 20 to 1 to 60 or over. Sometimes the flux is placed on the bed of coal, sometimes on top of the iron charges, sometimes it is used only at the beginning, sometimes only at the end of the heat, and more often, perhaps, with every charge of iron. Where such wide latitude in method exists in practice, it is fair to infer that the use or non-use of fluxes in melting pig iron in a cupola has but little effect upon the character of the iron, i. e., upon its component elements. In my own practice, extending over about thirty years, I have tried all of these methods, and a great variety of fluxes, while for some time past, I have been using no flux of any kind in the cupola. It is proper to explain in this connection however, that in this case no coke is used, the melting in the cupolas being effected with anthracite coal, as economically, at present prices, as with coke, and with distinct advantages over coke with respect to the smaller amount of sulphur absorbed

by the iron, the less quantity of slag formed, the greater length of time the metal will remain fluid after tapping, etc. The slag formed, when melting with anthracite, is so small in quantity that it is not tapped from the slag hole provided for the purpose and the space between the tuyeres and the lining of the bottom of the cupola is much less than is necessary when coke is used as fuel.

"To sum up in a few words, it may be readily inferred from the foregoing statements that I do not rely upon fluxing to improve the quality of the iron melted in a cupola, except in a very limited degree, but I do recognize the advantage accruing from the moderate use of fluxes, especially when coke is the fuel employed, in order to increase the fluidity of the slag, thus to assist the passage of the air blast through the burden, and finally to insure a clean drop when the melting is over.

Valueless Records.

Mr. Outerbridge asserted his conviction that tensile strength records of cast iron as given in technical books and magazines have no meaning or value unless the size of the test pieces are stated. A difference of ¼ inch in diameter of two iron tensile test bars cast from the same ladle of iron may make a difference of as much as 5,000 pounds per square inch in the record of tensile strengh. Moreover, with one kind or grade of iron the larger bar may be always the weaker, while with another kind of iron the smaller bar may always be the weaker of the two. "I have," said Mr. Outerbridge, "many records of such tests to substantiate these surprising statements. These facts surely suffice to prove that in cast iron we have an alloy of highly complex nature. It is a melange of one-half dozen well known elements, and not infrequently contains a trace of one or more comparatively rare metals, all of which exert an influence upon the properties upon the alloy. Thus, a small amount of titanium hardens cast iron, while tungsten seems to have an opposite influence. It is frequently asserted that a trace of copper renders cast iron very brittle. Yet I have alloyed copper with cast iron in various amounts from 0.1 to 1 per cent and have failed to discover this tendency. It certainly closes the grain."

Manganese Maligned.

Pointing out errors which are found in new text books, Mr. Outerbridge said that the statement that manganese is a hardening element in cast iron is misleading. When present in excess—say 4 per cent—manganese makes gray iron very hard, but is hungry for sulphur and oxygen, and when added in powdered form in a small quantity to the ladle of molten high chilling metal, such as car wheel iron, instead of increasing the hardness of the metal, it has the opposite effect, because of its desulphurizing and deoxidizing influence. One pound of this powder added to a ladle of 600 pounds of car wheel iron changes nearly one-half of the combined carbon to the graphitic form, lowering the shrinkage of the metal nearly 28 per cent; taking out one quarter of the sulphur, causing a marked softening of the gray iron portion and an immense improvement in the strength and ductility of the car wheel. In conclusion Mr. Outerbridge said:

"Manganese has been universally maligned as a hardening element in cast iron, the authors of such statements failing to realize that it performs two distinct functions, one as a hardening element, if in excess; the other as a softener of high chilling iron when that element is otherwise deficient in quantity.

"I may venture to say, furthermore, that if the founder allows the proportion of manganese to fall too low—say below 0.3 per cent—he is certain to have complaints of hard castings. This was clearly shown in a paper on 'Hard Castings' read by Henry Souther at the meeting of the American Society for Testing Materials, July, 1905. After stating that castings had been submitted to him for examination on account of being too hard to machine, he says he found that the constituents were normal except manganese, viz., silicon 2.50 per cent; phosphorus 0.70 per cent; sulphur 0.08 per cent; carbon 3.50 per cent; manganese 0.16+ per cent. Means were taken to raise the manganese to the neighborhood of 0.50 per cent and as soon as this was done the difficulty disappeared in the machine shop and has not reappeared after months.

Use of Ferro-Silicon.

"Silicon is the great softener of all kinds of cast iron and is usually added in the cupola in the form of 'silvery gray pig,' which may contain anywhere from 4 per cent to 10 per cent of silicon. Sometimes alloys containing even more silicon are added with pig iron in the cupola for the purpose of enabling the mixture to carry a larger proportion of scrap than would otherwise be prudent. Silicon charged into cupola softens the metal, but always reduces its strength.

"I have announced on several occasions during the past two years, and published in various papers, the interesting, and I believe, valuable discovery that when an alloy of iron and silicon is added to ladles of molten iron, in the form of high grade ferro-silicon (containing about 50 per cent of the latter metal) it not only softens, but at the same time strengthens the iron, thus reversing the universal experience that softening iron reduces its strength.

"The gain in strength varies with the kind of iron and the proportion of ferro-silicon added to the ladle. In some of my tests I have found an increase of over 25 per cent in strength with a decrease of hardness that is quite remarkable. These tests are easily made in any foundry where transverse test bars are cast and broken.

"Another interesting and important feature of this method of manipulation is that by varying the amount of powdered material added to the ladle the proportion of silicon can be changed to suit the requirements of any individual casting or any group of castings."

FOUNDRY COSTS DATA.

To ascertain the practice in respect to foundry costs usually followed by operators, Kenneth Falconer, of Montreal, Que., chairman of the committee on costs of the American Foundrymen's Association, is sending out circulars to members for data on this subject. This information will be presented with the committee's report at the Philadelphia convention of the association, May 20-24. The questions asked are as follows:

1. When making estimates for selling purposes do you figure on
   (a) Average cost per pound?
   (b) Cost of metal, core making and molding separately?
2. Do you
   (a) Regularly and continuously operate a system of foundry cost keeping?
   (b) Do you simply make up the cost of particular or occasional castings or lots of castings?
3. Do you figure the cost of your foundry output
   (a) Weekly?
   (b) Monthly?
   (c) Yearly?
4. Do you pay for molding
   (a) By day wage?
   (b) By piece work?
   (c) By any other system than by day or piece work?
5. Do you pay for core making
   (a) By day wage?
   (b) By piece work?
   (c) By any other system than by day or piece work?
6. Is the time of molders
   (a) Kept by order numbers?
   (b) By themselves or by a time clerk?
7. Is the time of core makers
   (a) Kept by order numbers?
   (b) By themselves or by a time clerk?
8. On what basis do you distribute the cost of superintendence and other general items on the cost of castings?

THE BLAST FURNACE---II.

By Horace Allen.

The ideal conditions to be aimed at in the smelting of iron by the blast furnace are:

(1)—Materials uniform in quantity and size.

(2)—Materials constituting the charge to be added continuously.

(3)—Perfect mixture of the ore, fuel and flux.

(4)—Continuous application of the blast at the normal pressure.

(5)—Uniform composition of the air blast.

(6)—Uniform temperature of blast.

In practice none of these ideal conditions can be obtained, so it is important that the best compromise possible be effected. In considering the first ideal condition, uniformity of the quality and size of the materials employed, possibly there is very little room for improvement over common practice, for either a certain grade of ore, fuel and flux, is employed, being easily available within range of the furnace location, or where different classes of ore and fuel have to be made use of, they are so proportioned as to give as high a degree of uniformity in quality as possible. The exceptions are chiefly due to the amount of moisture carried at different periods as the result of prevailing atmospheric conditions, and the irregularity of the supply of the different classes of ore constituting the available mixture. The available supplies of iron ore differ very considerably in richness in the various districts in which they are obtained, but iron of good quality can be produced from very poor classes of ores. However, the material charged must be maintained uniform, else the resulting pig iron will vary in quality also.

In stating that, ideally, the materials constituting the burden of the furnace should be charged continuously, the object indicated was to keep the level of the materials in the furnace constant; the resistance to the passage of gases also, as nearly constant as possible. In practice the materials are charged at intervals and in certain weighed quantities; in most instances the length of the intervals of charging is not constant, owing to the changing of shifts, etc., and it is probable that if the charging was carried out in a more regular manner, by adding smaller quantities at as nearly as possible regular intervals, considerable improvement in the working of the furnace would obtain. The reasons for this will be apparent when considering the other ideal conditions following.

Already the reasons for perfect mixture of the ore, fuel and flux have been referred to, and are obvious. At whatever pressure of air blast supply the furnace works best, the continuous supply of blast at this normal pressure should be maintained as far as is possible. The reason for this, as well as other conditions referred to, is that the interior of the furnace becomes under normal conditions, divided up into certain zones in which different reactions take place. Roughly, these zones may be described as: (1) preparation, (2) reduction, (3) heat interception, (4) fusion.

Referring to the diagram given in the preceding paper, various zones have been located by the changes in the heat curve and chemical reactions, and approximately represent normal conditions of work.

It will be obvious that if the charging of materials is delayed for such a period that the stock falls, say 20 feet, the zone of preparation and part of the zone of reduction would be absent, the gases would escape at a very high temperature, the resistance offered to the blast would be considerably reduced, and the normal conditions in the furnace generally upset. This derangement becomes intensified by the renewal of charging operations; cooling the zone of reduction would alter the temperature conditions from normal, and until the fresh material charged has become heated and dried normal conditions would not be restored.

In regard to maintaining the best normal conditions in the furnace, the blast supply is principally to be considered. This would be evidenced by the alteration in the temperature curve when the blast supply was suspended altogether for a period.

The emergencies of the practical working of the furnace ncessitate the shutting off of the blast at certain times for longer or shorter intervals, and this has a great effect upon the furnace. The temperature "curve" immediately takes the form of a straight line, commencing at the temperature of the molten iron and slag, and tapering off in a straight line to the temperatures of the materials at the stock line. Under these conditions the various zones become blended into one.

The worst effect is that the temperature in that part of the furnace occupied by the zone of fusion continually increases, owing to the cooling effect of the reduction of CO_2 to CO having ceased, and the temperature of the whole of the contents of the furnace tends to become uniform; the lower part cools while the upper part of the stock rises in temperature.

Upon again turning on the blast, the immediate result is not a restoration of normal conditions for the fusion zone becomes very considerably increased in height above the hearth, and slag formation takes place at a higher point than under ordinary working conditions. The longer time the blast is shut off the longer will be the time for the furnace to become restored to normal and regular work.

In this connection, any change in the pressure at which the blast is supplied, is accompanied by a change in the volumes occupied by the various zones, by a change in the temperature curve. A restricted supply of blast, while maintaining the temperature at the tuyeres at about 4,800 degrees Fahr. would be followed by an increase in the temperature in the lower part of the zone of fusion, because the small proportion of CO_2 reduced to CO would have little effect in reducing the temperature.

It is well known that reduction in the pressure, or temperature of the blast, causes a change in the quality of the iron produced and these changes are only applied when the quantity of metal is to be altered.

Note.—The first article of this series appeared in the Iron Trade Review of March 14, 1907.

Students Inspect Plants.—Eighty-eight junior and senior mechanical, chemical and electrical engineering students of the Ohio State university, on their annual tour of inspection of large manufacturing plants, visited a number of the large establishments of Milwaukee. The party inspected the Allis-Chalmers plant and were guests of the company at luncheon. Other plants looked over were those of the Milwaukee railroad, the Milwaukee Gas Light Co., the National Brake & Electric Co., the Nordberg Engine Co., the Fred M. Prescott Steam Pump Co., the Milwaukee Coke & Gas Co. and others. From Milwaukee the students went to Chicago and visited various plants there. A week was spent by the students on their trip.

HOMESTEAD STEEL WORKS---OPEN HEARTH NO. 4.

This plant designed and built by the Carnegie Steel Co. is the latest large open-hearth installation to be completed and in operation in the Pittsburg district. In its erection a splendid record for speed was made as detailed in THE IRON TRADE REVIEW of July 12, 1906, just six months elapsing from the time the first drawing was made till the plant was ready for operation with four furnaces completed. There are at present ten basic furnaces, but the layout of the plant provides for the erection of four additional units at the east end of the mill. As the mill building now stands, it is 828 feet long and 137 feet 6 inches wide, heavily built with steel on concrete foundations with a single monitor roof and a lean-to the length of the building over the charging floor. The longitudinal bays are 36 feet span and the structural members are designed to carry two of the 125-ton pouring cranes loaded in one bay. A longitudinal row of columns marks the dividing line between the charging and pouring floors and supports the girders for the crane runways. Corrugated iron sheathing, galvanized, encloses the building.

The plant is of the two level type, the pouring floor being on a level with the yard and the charging floor fifteen feet higher. On the charging level side of the building, the ground has been raised to the same height as the floor by a slag fill. A stock yard 62 x 792 feet extending along the building and spanned by four Alliance Machine Co. 5-ton gantry cranes has been laid out. Both standard and narrow gage tracks traverse the stock yard with narrow gage spurs running in to the charging floor, arranged so that the charging boxes can be delivered in position directly to the charging machine by the narrow gage locomotives. The stock yard parallels the Pennsylvania railroad, affording standard gage connections with minimum trackage. The stock yard and charging floor are equipped with 300 charging trays, which means for their handling, 100 charging cars.

The charging floor which is built of brick laid on steel plate between I-beam spans, is supported on the inside by the central columns and on the ends and outside by a concrete wall. Three Morgan Engineering Co. 5-ton electric charging machines and two 60-ton hot metal cranes built by the same firm serve the furnaces. The narrow gage track for the movement of the charging boxes extends the length of the floor.

The furnaces are of the stationary, solid bottom type, the bath resting on a concrete block 36 feet 6½ inches long by 21 feet deep x 7 feet 6 inches wide. The units are spaced 72 feet centers and have a rated capacity of 55 tons, though the working average is more nearly 60 tons and as high as 70 tons has been done with the slag all off the metal in the ladle. The inside measurements of the hearth are 15 by 29 feet and of the port ends 10 feet 6 inches by 15 feet 6 inches. The fuel is natural gas, entering through double, opposed burners at each end, reversals being made every fifteen minutes. At present, the charge consists almost entirely of cold metal, scrap and ore, with an occasional ladle of hot metal, when a surplus existing at the Carrie furnaces makes hot metal available. The increased blast furnace capacity now building at the Carrie plant is intended to supply the No. 4 open-hearth mill, however, and the installation of what will probably be a 200-ton hot metal mixer will follow, space being already provided at the west end of the mill building at which end the hot metal enters. The steel is carbonized with anthracite coal.

The furnaces are also provided with a cinder notch for running off the slag in case it is desired to use the Monell process, and square iron slag cars, which can be run directly under the cinder spout are at hand, thus providing for the easy disposal of the cinder. The three charging doors of the furnace are flanked on either end by smaller doors for cleaning and patching the hearth, and are operated by hydraulic pressure as is also the 10-ton column jib crane with which each furnace is provided for handling the pouring spout. The furnaces will handle about 200 heats on one lining, or about 12,000 tons of steel which indicates a life of about 75 operating days.

The regenerators for the furnaces are of the ordinary type built directly under the port ends with a 6-foot downtake and extending over to the duct leading to the chimney, which, instead of being located centrally with respect to the furnace, is at one end. This arrangement permits of economy in the width of the building, while in the other direction ample room is afforded for the present layout by the necessarily large distance from center to center of furnaces. The reversing valves are located between the regenerators directly opposite the center of the furnace and are of the usual butterfly pattern. In the regenerator checker work, 4 x 4 x 10½-inch brick are used. The regenerator gallery is on the same level with the casting floor, and in front of the regenerators running the length of the gallery is a narrow gage track intended for the handling of cars used to carry off dust cleaned from the checkerwork.

The casting floor is provided with tracks entering at either end of the building, and through two doors in the side. Three 125-ton Morgan cranes span the level, and like the 60-ton cranes, each has a 25-ton auxiliary hoist. Directly under the monitor and over the large cranes is a 10-ton auxiliary crane for handling repairs on the large carriers. The plant uses 12 60-ton ladles, which, in position for pouring, rest under the pouring spout on two fixed metal supporting frames with the top of the ladle about on a level with the charging floor and the bottom of the ladle clear of the casting floor, so that practically no ladle pit is necessary. For each furnace there is a shallow ladle cleaning pit, over which the ladle may be upset and relined, the ladle trunnions resting on metal stands in such a way that the ladle is free to be turned over.

There are four pouring platforms with a hydraulic car pusher at each for the handling of the metal from the ladles into the ingot molds, and in the mold yard a 200-ton electric ingot stripper for freeing the molds from the metal. The mold yard is 81 feet by 396 feet, and adjoins the pouring floor just outside the building. It is spanned by a 20-ton Morgan crane.

As mentioned in the previous article, to bring hot metal from the furnaces required the building of a viaduct over the Pittsburg, McKeesport & Youghiogheny and P. V. & C. railroads and to get the steel to the mills required the tunneling under the same roads. A great deal of concrete has been used both in this railroad construction and in the mill building foundations where chimney, furnace, column and wall foundations are of that material.

The Carter Iron Co., of Pittsburg, with a blast furnace at Ivanhoe, Va., has appointed Jos. G. Walton, of the Robt. Field Agency, as sales agent for Western Pennsylvania, Ohio, Indiana and Michigan.

COST OF EQUIPPING FOUNDRIES FOR THE MANUFACTURE OF OPEN-HEARTH STEEL CASTINGS.

By W. M. Carr.

Owing to the widespread interest manifested in the erection of steel casting plants there is considerable speculation as to the cost of their equipment. The following estimate is made on the basis of daily capacity of sound and salable castings. The calculations are based on the cost per ton of furnace capacity:

Furnaces only	$1,200
Gas producers and gas mains, or oil storage tanks and accessories	600
Buildings, 800 square feet of floor space per ton, at $1.25 per foot	1,000
Power, machinery, cranes, hoists, molding machines, tools, drying ovens, etc.	2,300
Total cost per ton	$5,100

These figures are based on a plant having an estimated capacity of 150 to 160 tons per day, or 4,000 tons monthly, with an equipment of five open-hearth furnaces costing approximately $750,000. A single open-hearth furnace lined for acid melting costs very nearly $1,000 per ton capacity. One for basic melting costs $1,200 per ton of output. These figures cover excavation, brick work, castings and structural material, including stack, but do not cover the platform or facilities for charging.

The average capacity of a furnace for open-hearth steel casting work is 20 tons. The number of furnaces in operation in a given shop with two or more furnaces will vary according to the demand. When castings are the only product, at least one furnace should be kept in reserve, pending repairs or a shut-down in the active furnaces. This will equalize deliveries and production. Gray iron foundries using steel castings will undoubtedly find it profitable to install an open-hearth furnace which should be of a size that can conveniently fit in with the existing equipment for handling ladles of hot metal. The writer would recommend a basic lining, since it permits the purchase of cheap iron and almost any kind of steel scrap. The basic process has reached such a stage of development that any foundryman of intelligence can successfully acquire the skill for its profitable operation. Modern foundry chemistry is fatal to mysterious information. There are no secrets or esoteric systems known only to the few. The principles of basic practice are an open book.

With a basic furnace in an active gray iron foundry of anything like a modern character, it would be perfectly feasible to manufacture steel castings in moderate, profitable quantities in conjunction with the regular product. About the only change necessary in the molding end of the practice would be a supply of silica sand and a sand mill to prepare the molding mixtures. A furnace of convenient size would have a capacity of 5 tons per heat. Such a furnace could easily produce four heats in 24 hours and could be depended upon to regularly make at least three, and if desired, only one heat per day. In the meantime, however, there would be a steady consumption of fuel to keep the furnace hot. The fuel should be either natural gas or fuel oil. Producer fuel is often uncertain, irregular in composition, and requires additional labor for attendance and maintenance.

A 5-ton basic open-hearth furnace would cost approximately $6,000, if erected in a modern active iron foundry. As an additional outlay to cover bottom pour ladles, furnace platform, oil storage tanks, pumps, oil piping, burners, etc., a liberal figure would be $4,000, making a total expenditure of $10,000, not including, however, the buildings.

Charging five tons per heat, consisting of 50 per cent pig iron and 50 per cent scrap, there should be produced under normal practice, 12¾ tons daily at the rate of three heats in 24 hours. The loss or shrinkage is estimated at 15 per cent, which includes the melting loss, gates, risers, sculls and defective castings. The melting loss in the furnace is, on the average, seven per cent. This low loss is an important economical factor.

With a normal demand for castings, an average profit of ½ cent per pound could be expected, or $10 per net ton of product, which would be equivalent to $127.50 per day. There would be times when the furnace would be out of commission for repairs, periods which should not exceed one month at the most, but under ordinary conditions two weeks should cover general overhauling. With proper care, a basic furnace is capable of producing 400 heats before undergoing general repairs, or a campaign of 133 working days; in round numbers, four months. Assuming the active period for production would only be nine months in the year at the rate of 25 working days per month, there would be a productive period of 225 working days. At the rate of 12¾ tons per day or a yearly total of 2,868¾ tons at $10 per ton, the plant would yield a profit of $28,687.50, figures which look attractive from a promoter's view point and might be vivid to embody in a prospectus. But, there would be times when the yield would shrink considerably, owing to errors in practice, breakdowns, delays and other detractive conditions, which would seriously decrease the difference between manufacturing costs and selling prices. As an extreme case, it will be assumed that the yield over metal charged was only 50 per cent good castings for the entire productive period as estimated; that the average profit was decreased to ¼ cent per pound and that the tonnage was only 7½ tons daily or 1,687½ tons yearly. The profit then would be $4,218.75, and charging off 25 per cent for interest, replacements, depreciation, etc., there would be a net return of $3,164.07 on an investment of $10,000 for a five-ton furnace in an active iron foundry. This would be equivalent to a profit of 31 6-10 per cent on the outlay, which, in view of the extremely unfavorable conditions considered in the estimating, makes a steel foundry as profitable as any foundry enterprise.

An open-hearth steel foundry, with intelligent practice and normal times or demand, offers an attractive venture to the investor and no doubt will receive the attention of gray iron founders who are interested in steel casting manufacture.

THE SUPPLY OF AIR FOR COMBUSTION.

As applied for supplying air for the combustion of fuel a fan blower varies in type according to the character of the furnace. For the production of mechanical draft, for steam boilers, under either the forced or induced draft system, the fan may be of ordinary steel plate construction, designed to operate at a maximum pressure of from one to one and one-half ounces per square inch. Here the fires seldom exceed ten inches in thickness. On the other hand, in the foundry cupola, with its superimposed charges of fuel and iron aggregating ten to fifteen feet in depth, a pressure ranging from eight to possibly 16 ounces per square inch is essential to compel the passage of the air through the tortuous channels formed by the mass of material within. The total quantity of air required under these conditions is relatively small, while the type of fan is distinctive, being narrow, of high efficiency and maximum durability, but of only moderate volumetric capacity.

The forge fire and the puddling furnace present conditions less strenuous; nevertheless they both depend upon the fan blower for successful operation. Aside from its application for blowing the forge fire, a separate fan may be utilized for withdrawing the smoke and gases direct from the forge hoods. At least one instance exists where these gases have been subsequently utilized to heat the air discharged by a blower system for the warming of an adjoining building.

Air under pressure fed into a stream of gas or of atomized oil insures its satisfactory combustion and application in the arts. Pulverized fuel is burned by thorough admixture with a current of air and subsequent ignition in a suitable furnace.

A TRAVELING CANTILEVER CRANE FOR SHIP YARD USE.

The accompanying illustrations show a traveling cantilever crane recently built by the Wellman-Seaver-Morgan Co., Cleveland, for the Mare Island navy yard, California. The crane runway is located between two building slips in one of which is to be constructed the collier authorized at the first session of the last congress.

The crane runway is 613 feet long and has an average height to top of rail of 69 feet. The gage of the rails on the runway is 20 feet. The cantilever has a total span of 224 feet, and a total trolley travel of 218 feet. The lower chord of the crane is 32 feet above the runway rails. The crane capacity is 30,000 pounds at 60 feet distance on either side of the runway, and 15,000 pounds throughout the whole length of the crane arms. Hoisting can be done at three speeds: 30,000 pounds at 100 feet per minute; 15,000 pounds at 200 feet per minute; or 5,000 pounds at 500 feet per minute. The trolley movement has a speed at full load of from 400 to 600 feet per minute, while the crane can travel along the runway under full load at a speed of from 400 to 600 feet per minute. In calculating these speeds, an allowance was made for the pressure on the load due to a wind of 35 miles per hour. All three motions can be used at the same time.

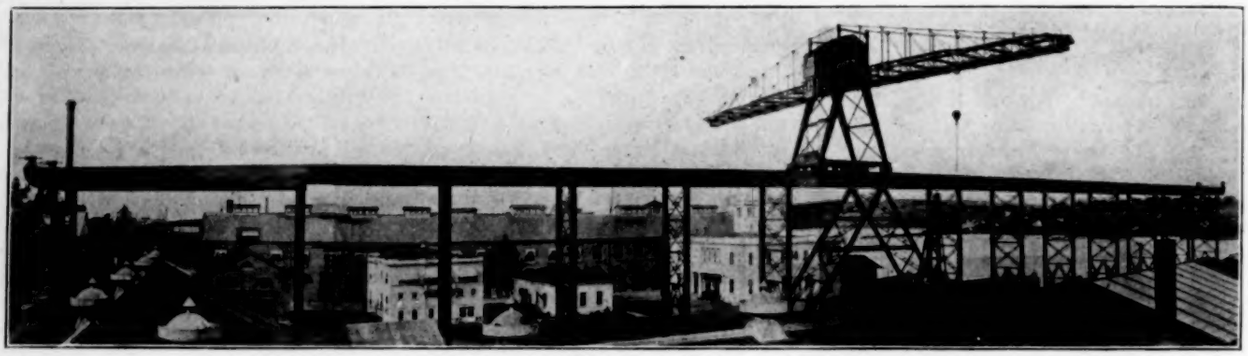


FIG. 1.—CANTILEVER CRANE AT THE MARE ISLAND NAVY YARD.

Three motors are used, each using direct current at 220 volts. This current is supplied by a pair of rails situated between the main crane runway rails, as shown in Fig. 2. The hoisting motor is compound and of 150-horsepower. The trolley motor is of 40 horsepower. These are installed in the operator's cage on a level with the crane arms. The bridge motor for causing the crane to move along the runway is of 100-horsepower, and is located in a small motor house shown at the base of the crane tower. All three motors are controlled from the operator's cage by means of magnetic clapper switches installed by the Electric Controller & Supply Co., Cleveland.

The device shown in Fig. 3 is used to guard against tilting of the crane when it is carrying a load at its extreme reach. A wheel bears against the under side of the upper flange of the runway girders, being driven from the axle of the traction wheels at the same speed at which the crane travels. Normally this does not bear against the girder, but any tendency to tilt brings it in contact with the upper flange and thus steadies the crane.

The runway is supported by pin-connected bents on pile and concrete foundations. The main support, however, is an A-frame, located at the middle point of the runway. The runway is free to expand either way from the A-frame. Spring buffers at either end of the runway provide against over running of the crane, and also automatically shut off the current from the motors when the crane comes in contact with them.

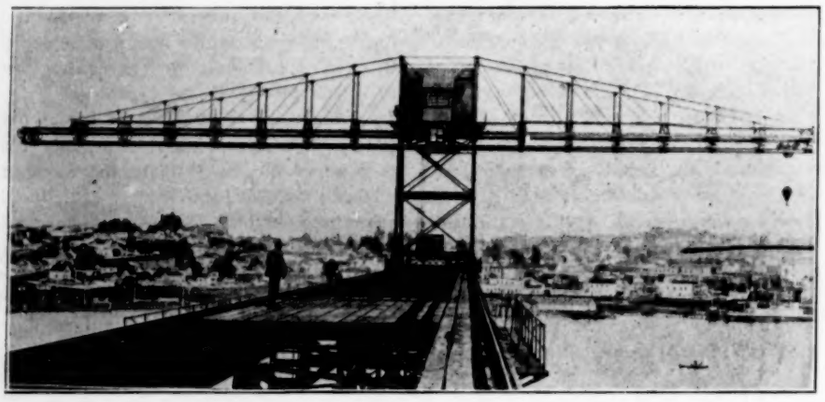


FIG. 2.—RUNWAY AND BRIDGE OF MARE ISLAND NAVY YARD CRANE.

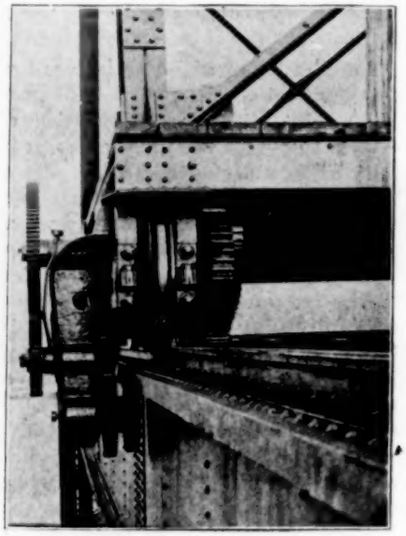


FIG. 3.—DEVICE TO PREVENT TILTING.

Dispatches from San Francisco state that the union iron men affiliated with the iron trade council of that city have ordered a strike May 1. More than 6,000 men are involved. An eight-hour day is demanded by the men. The strike will affect the Union Iron Works, the Risdon Iron Works, machine, copper and boiler shops and all the construction work which requires the use of iron.

A STATIONARY CENTRIFUGAL GAS WASHER.

The accompanying illustrations show a stationary centrifugal gas washer recently patented by F. E. Bachman, Port Henry, N. Y. The washer consists essentially of a vertical cylinder whose interior is covered with a descending sheet of clear cold water, a rapidly flowing current of dust laden gas being admitted to the cylinder and caused to flow in a helical path, due to its admission through a tangential inlet. The rotary motion of the gas by centrifugal force throws the particles of solid matter against and into the sheet of water at an angle to its flow of nearly 90 degrees. Centrifugal force holds the particles in the sheet until they are wetted and carried away. The remarkable efficiency claimed for the washer results from the dust being held in contact with the water until it is wetted, instead of its rebounding and being carried away with the gas as lighter particles sometimes tend to do. The efficiency is also promoted by the fact that the dust strikes a rapidly flowing current of water, which is always free from scum.

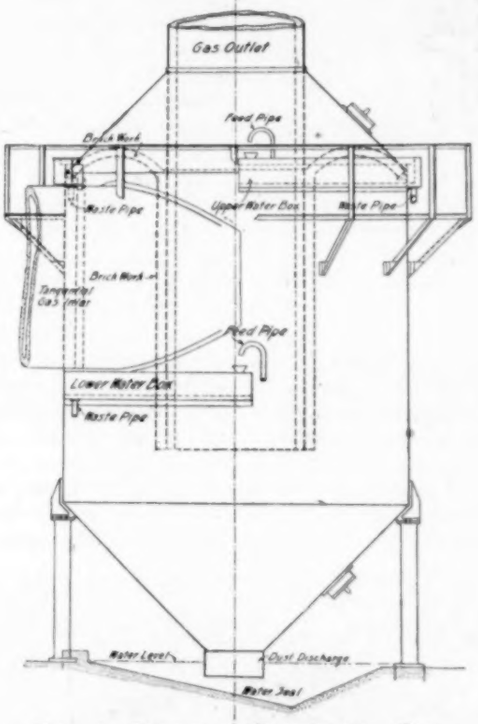


FIG. 1.—BACHMAN CENTRIFUGAL GAS WASHER.

The first washer embodying this principle was erected by the Northern Iron Co., Port Henry, N. Y., in 1904. The inner surface was coated with water from perforated pipes inside the shell. A cast iron helix between the shell and the outlet caused the gas to follow a spiral path. The helix was broken by a gas explosion, and it was then removed without reducing the efficiency of the washer. The water openings in the spray pipes continually clogged, resulting in too small a quantity of water being supplied to prevent steam from being formed, with a consequence that wet gas was furnished. This defect was overcome by the water device shown, which was applied to the washer at the Northern Iron Co.'s Standish furnace in 1905, and has been in successful operation ever since without repairs or attention.

The present method of supplying water to the interior surface of the shell, by which wet gas is prevented and by which a regular supply of water is assured, is by the use of two water distributing boxes forming water seals and discharging into the washer through openings in the shell. The top one which extends about ¾ of the circumference of the washer is divided by transverse partitions into three compartments, each of which is provided with an independent gravity water supply and a wash out pipe. The apron is made removable to facilitate cleaning the openings, which admit water through the cylindrical shell without stopping operations. The inventor states, however, that this precaution has proved unnecessary, as the openings have never clogged. The lower box placed under the intake extends about 1-3 of the circumference of the shell, and is of the same construction as the upper one, excepting that there are no partitions. The openings admitting water to the interior are 5/16 inch diameter and are pitched 5 inches apart. The head of water in the inlet section of the water box exceeds the gas pressure by just enough to cause it to rise to and flow through the inlet openings. On entering the cylinder the rotating current of gas distributes the water over the entire inner surface. The dust taken up by the water is carried into the water seal at the bottom of the washer, from which it is removed by a portion of the tuyere water into the sewer.

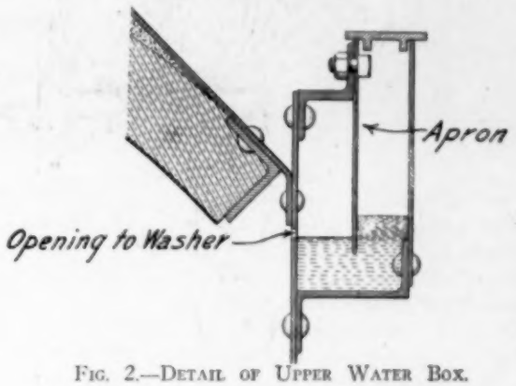


FIG. 2.—DETAIL OF UPPER WATER BOX.

All portions of the interior not covered with water are protected by brick linings. The water protects the shell of the washer from injury by the dust thrown from the gas.

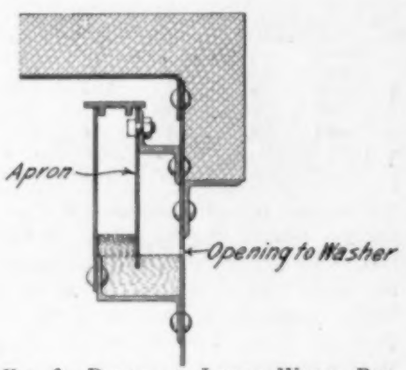


FIG. 3.—DETAIL OF LOWER WATER BOX.

Some of the results accomplished by the use of this washer are as follows:

Combustion chambers of the stoves require cleaning but four times a year. The stoves are as efficient after 28 months of use as when started. But little dust is deposited under boilers.

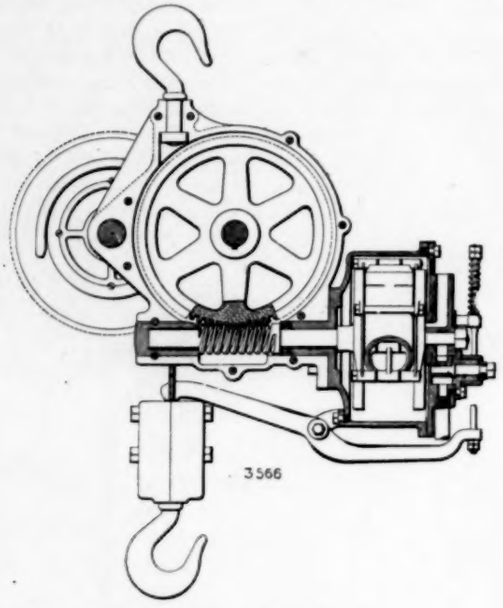
The total accumulation in the flues, under the boilers and in the stoves was less than two carloads. The flue dirt handled in the same time was 12,318 tons. There is no appreciable loss in the heating efficiency of the gas. A number of tests have been made, the results of which are shown in the following table. Samples were taken every 30 minutes. The dust was determined by filtering through glass wool and the moisture by condensation on glass wool and by calcium chloride. The furnace was settling rapidly while sample No. 4 was being taken and slipped 4 feet 6 inches while sample No. 5 was being taken.

Test No.	Gas Temp. deg. Fahr. entering.	Gas Temp. deg. Fahr. leaving.	Moisture Increase Grs. per cu. ft.	Dust grs. per cu. ft. entering.	Dust grs. per cu. ft. leaving.
1	340	280	3.4	18.1	0.02
2	460	380	4.6	17.6	0.04
3	580	490	5.4	16.8	0.03
4				20.8	0.08
5				23.7	0.12

A washer 18 feet diameter will clean the gas from a furnace using 50,000 feet of air per minute. Such a washer has about 1,800 square feet of effective water surface and its cost is $3 to $3.50 per square foot of surface. The water required for a washer of this size can be supplied by four 1½-inch feed pipes. If it is desired to cool the gas preliminary to cleaning for gas engines, the offtake can be enlarged and the ascending gas sprayed. This washer can be converted permanently into a centrifugal dust catcher by lining the shell, or temporarily by turning off the water and spraying the exterior of the shell.

THE IMPERIAL AIR MOTOR HOIST.

The accompanying illustration shows the Imperial air motor hoist built by the Ingersoll-Rand Co., 11 Broadway, New York. The advantage of this type of hoist is that it does not require a great height above the lift, and requires no more height for a high lift than a low one. The movement is controlled both for hoisting and lowering, and the load may be held at any point desired. The hoist is operated by means of an air motor driving a worm and wheel, which in turn drive the drum through a train of gears. The motor is a positive action reversible air engine with no dead centers and a practically uniform torque. There is no delicate valve mechanism requiring adjustment or liable to failure. All operating parts are entirely enclosed and dustproof. The splash oiling system is provided, every bearing being bathed in oil.

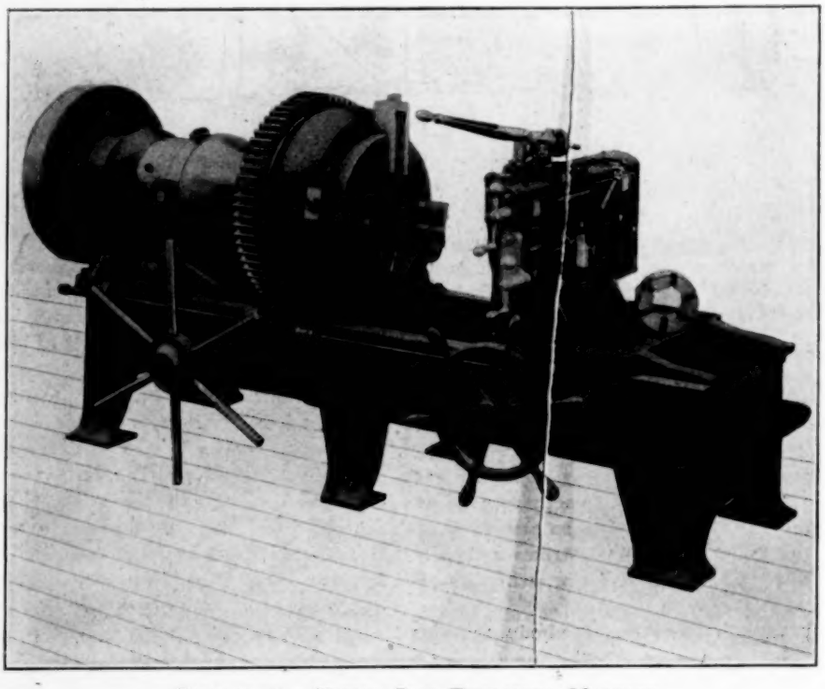


Imperial Air Motor Hoist.

The steel worm on the motor shaft runs in an oil pocket. Its thrust is taken by a roller bearing. The worm meshes with a worm wheel of bronze and a pinion on the worm wheel shaft engages the drum shaft gear. On the large sizes of hoist, there is an additional speed reduction. The hoisting rope under-runs a groove permitting an exact equalization of the two sides on the drum. The hoisting hook turns on ball bearings, and one load may be turned in any direction without touching the rope and without its turning back. The hoist is made in five sizes, of capacities ranging from 1,000 to 10,000 pounds using the ordinary air pressures.

A NEW PIPE THREADING MACHINE.

A new pipe threading machine has been placed on the market by the Bignall & Keeler Mfg. Co., Edwardsville, Ill., which is known as the P. D. Q. C. No. 6. The machine is provided with a quick operating chuck, which is operated by means of a hand wheel and pinion. The pinion engages a rack on the end of the cone shifting arm, which latter slides freely on the arbor. As it is moved forward, the chuck arms, which are provided with rollers in the end, roll up on the large diameter of the cone,



Bignall and Keeler Pipe Threading Machine.

thereby tightening the chuck jaws on the pipe. On moving the cone back, springs draw the jaws away from the pipe. The jaws in the chuck are of steel and are graduated. When once set for a given size of pipe, the entire lot can be threaded without stopping the machine. The rear chuck is provided with three independent jaws with which fittings can be made up. There are also bushings for holding the pipe central, yet not gripping it. Eight changes of speed are obtained through a four-step cone pulley and shifting gears. In connection with the machine, the "Peerless" die head is used. The machine has a range of 10 sizes from 1¼ to 6 inches, inclusive.

SOME NEW LATHE SPECIALTIES.

In the accompanying illustrations are shown some lathe specialties developed by the Armstrong Bros. Tool Co., Chicago. Fig. 1 illustrates an improved form of lathe tool post which combines strength with holding power and convenience. It comprises a pair of rocker jaws to grip the tool, which adjust themselves on parallel lines, thus holding the tool firmly, preventing chatter and facilitating accurate work. As it is of the "open side" type, it permits rapid and convenient change and adjustment of tools. The construction is such that it will work up close to the chuck, and there is a great range of adjustment without loss of holding power. By means of a pair of V-blocks fitted to the tool post, boring bars and similar round tools of various diameters can be conveniently held. It is made in four sizes for tools ranging from ½ to 1 inch and less up to 1 x 1¼ inches, and is adapted for use in lathes from 12 to 32-inch swing. Fig. 2 shows the tool post working up close to the chuck. Fig. 3 illustrates a three-bar boring tool, which is made from bar steel throughout. A slight turn of a single nut releases both bar and holder. The cutters between the bar are so adjusted that the strain brought on them tends to hold them tighter. Fig. 4 shows the tool in operation. It is made in three sizes, the smallest taking bars ½, ¾ and 1⅛ inches diameter by 8, 11 and 16 inches in length, respectively, up to bars 15-16, 1 5-16 and 1 13-16 inches diameter by 13, 18 and 24 inches in length, respectively.

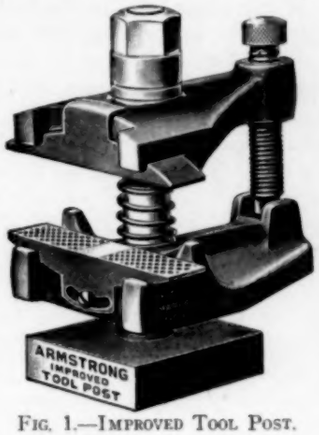


Fig. 1.—Improved Tool Post.

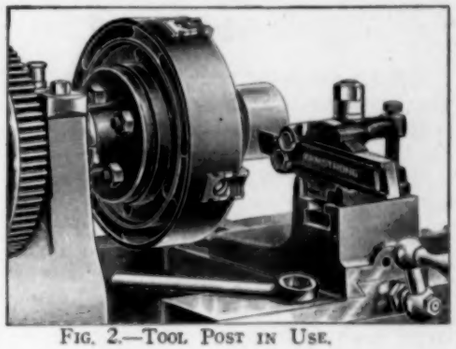


Fig. 2.—Tool Post in Use.

PREPARING FOR CINCINNATI CONVENTION.

Preparations are making rapidly for the joint convention at Cincinnati May 8-10, of the American Supply and Machinery Manufacturers' Association, the National Supply and Machinery Dealers' Association and the Southern Supply and Machinery Dealers' Association, replies having already been received from about 200 manufacturers and dealers who will attend. F. D. Mitchell, 309 Broadway, New York, who is in charge of arrangements, states that executive committees of the three associations have directed that manufacturers' exhibits will be discouraged. At this gathering, where the joint meeting of organizations heretofore holding separate conventions will bring many strangers together, a novel plan of identification has been arranged by Mr. Mitchell. Each attendant at the convention will be furnished with a badge, bearing in plain type the name of the wearer and the name and address of the company represented. The color of the ribbon attached will indicate the association to which the wearer belongs. Blue will designate the manufacturers, white the members of the National and red of the Southern, with a red, white and blue badge for ladies and special guests of the convention. Headquarters at Cincinnati will be at the new Hotel Sinton.

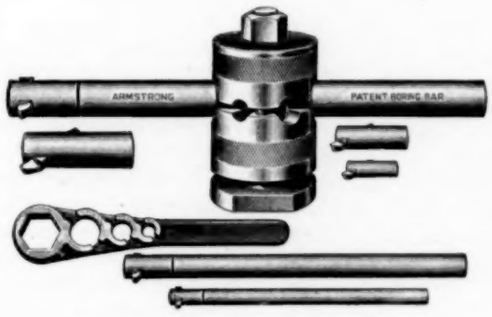


Fig. 3.—Three-Bar Boring Tool.

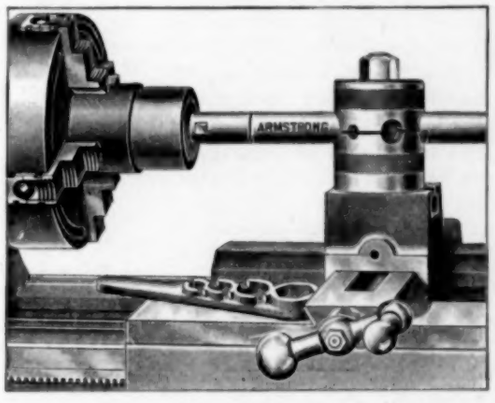


Fig. 4.—Three-Bar Boring Tool in Use.

Asks Stock Ruling.—A friendly suit has been brought against the American Iron & Steel Mfg. Co. Lebanon, Pa., by a stockholder to decide whether or not the preferred shares are entitled to participate equally with the common shares in the distribution of earnings in excess of five per cent on both classes. The company has declared quarterly dividends of two per cent each on both classes of stock, payable five-eighths thereof on April 1, while the remaining three-eighths has been temporarily suspended pending a decision on the legal action. The preferred stock has received dividends at the rate of five per cent since the organization of the company. The common stock has recently been on an eight per cent basis.

CAR SERVICE PENALTIES

Are Not Just, Says President Finley, of the Southern Railway.—Railroad Notes.

At the annual banquet of the Merchants' and Manufacturers' Club, of Greensboro, N. C., April 3, President W. W. Finley, of the Southern Railroad Co., said:

"Efforts are made to defend car-service penalties on the ground that it is just to compel a railway to pay as much for failure to supply a car to a shipper as the shipper must pay if he fails to load or unload a car within a reasonable time after it has been placed at his disposal. The very title given to these car-service penalty laws —'reciprocal demurrage'—is suggestive of equity and reciprocity. The application of these penalties when a railway has wilfully declined or culpably neglected to perform its duty would not be unreasonable, but there is neither equity nor reciprocity in a law imposing these penalties without taking into account conditions of traffic or the physical and financial limitations that may make it impossible for the road to supply all the facilities demanded. Can a penalty for failure to supply cars be justified when it is imposed upon a road which, because of the inability of the car shops to fill their orders on time, does not possess the cars and can not get them? Can a penalty for failure to move freight rapidly be justified when it is imposed on a road the terminals and tracks of which are congested with traffic which is being moved to the utmost capacity of its motive power and track facilities, and when the road is exerting every effort to improve its facilities to the extent of its resources, and especially when both the car shortage and the congestion are in large part due to the failure of shippers to load and unload cars as promptly as possible? Such laws propose to penalize the roads for omitting to do that which their self-interest impels them to do to the limit of their ability.

"Demurrage is entirely different in its nature. It is a moderate and reasonable charge imposed upon a shipper for the use of property which does not belong to him and which, so long as it is held by him, is diverted from its proper function of a vehicle for transportation and converted into a warehouse. It is not profitable to the railroad which collects it, but it is an absolute necessity as a means of keeping railway equipment in service so as to meet the just demands of all and prevent discrimination in favor of a few. While it may subject individuals to expense and inconvenience by depriving them of indefinite free warehouse facilities, it is even more in the interest of the great body of shippers than it is in the interest of the railway."

Says Earnings Decrease.

In a statement issued on the problem of southern rates, W. J. Murphy, vice president of the Queen & Crescent route, says in part:

"It will also be noted—and this is the amazing feature—that the only item in which there has been no increase in the last ten years has been the average receipts by the railroad company per ton per mile. In fact, in 1906, they were actually less than they were in 1896 or in 1905 by the one hundredth of one per cent. At a time when prices in every direction are increasing and are higher than they have been in the last forty years, the average relative receipts from freight traffic on the line of the Cincinnati Southern are decreasing. The expense ratio is increasing faster than the earning ratio, and that which the company has to sell—transportation—is worth less than in 1896.

"Pressed on the one side for more taxes; more salaries; more wages made necessary by higher prices; for more facilities and absolute safety, and on the other by demands for lower rates which mean diminished earnings; in one direction or the other there must be disappointment."

Railroad Notes.

The Morrissey, Fernie & Michel Railway Co., Ltd., has ordered 15 30-ton coal cars from the Youngstown Car Mfg. Co., Youngstown, O.

The Burlington railroad has purchased 30 acres of land near McCook, Neb., and will at once proceed to erect a roundhouse and machine shops to cost about $200,000.

The first road to use the steel cross ties in Indiana is the Big Four which has installed several hundred of the ties between Rushville and Smith's crossing on the Chicago division.

The Norfolk & Western railroad has placed an order with the Western Steel Car & Foundry Co. for 1,000 40-ton hopper cars and a second order with the Roanoke, Va., shops for 243 40-ton flat cars. This is in addition to the recent order given the Roanoke shops for 1,500 coal cars and 25 cabin cars.

The directors of the Central of Georgia Railway Co. have decided to erect extensive shops at Macon, Ga., which will be several times the size of those now operating in that city. The works and equipment will be very extensive, and their estimated cost is $1,000,000.

The Tidewater railway has awarded dredging and bulkheading contracts for its new $2,000,000 steel superstructure pier, to be erected at its Sewell Point terminals, near Norfolk, Va., into Hampton Roads. The pier will be 1,000 feet long, 60 feet wide and 65 feet high, and it is expected will be completed in a year.

The first all steel Pullman car was placed on exhibition in Philadelphia recently for the inspection of Pennsylvania railway officials. Later it was taken to New York, where officials of other lines looked it over. The car has been named Jamestown in honor of the Jamestown Exposition, where the company will have a large exhibit. It weighs about 10 tons more than the ordinary Pullman and is built of steel, aluminum and brass.

The Pacific & Oregon Railway Co., Falls City, Ore., C. A. Barnum, general manager, announces that it is in the market for a large amount of 60-pound steel, locomotive cars and other material and supplies for about 50 miles of new electric and steam railroad; also machinery and supplies for a machine and repair shop, and for a complete electric lighting plant for the same road. Machinery for a saw mill, planer, sash and door factory and a stock of builders' hardware are also wanted.

The shops of the Grand Trunk railway system, now under construction at Battle Creek, Mich., are to be the locomotive shops for the lines west of the St. Clair and Detroit rivers covering divisions including about 1,000 miles of road and 300 locomotives. They will occupy a tract of 188 acres adjacent to the present freight yard and main line tracks. The buildings being erected are locomotive shops 185 x 833 feet, including both locomotive machine and erecting shops as well as the boiler and tank shop and the machine department of the latter; blacksmith shop 105 x 225 feet, frog shop 65 x 165 feet, pattern and locomotive shop 65 x 165 feet, store house 60 x 200 feet, in addition to power house, oil house and iron and brass foundries.

The total steam road mileage of Illinois shown in the report of the railroad and warehouse commission for the year ending June 30, 1906, was 20,553, an increase for the year of 487.44 miles. The total mileage of surface and elevated electric railways was 1,187.43, an increase for the year of 104.63 miles. The gross earnings were $165,001,319, an increase of $14,386,574, and the number of employes was 119,597, an increase of 4,190.

The Pittsburg & Lake Erie Railway Co., with headquarters at Youngstown, O., has filed a certificate with the secretary of state of Ohio, increasing its capital from $10,000,000 to $30,000,000. The new stock will be sold for use in the general improvement of the road.

Steady Improvement Noted in Securities.

A general strengthening movement that communicated itself to practically all active stocks and produced the best week of the year in the security market has brought added hope and cheerfulness for the future to investors. The one factor which has contributed most to bring about this acceptable turn of affairs, has been the relaxation in money conditions. The relief measures put into effect by the United States treasury department, namely, the depositing of custom receipts in the national banks and the anticipation in payment of government loans, have been largely responsible for the favorable development in the situation. In addition the announcement this week by the government of the plan to refund and redeem United States 4 per cents, which mature July 1, has given further assurance of a reinforced money market in the future. The reports of conditions in some of the great banking institutions abroad show the severity of the strain on money through which these institutions have just passed. An engagement of gold bought for import to New York was resold in London during the past week, owing to the decline in monetary rates here and the need of the gold by the English banks. In New York call money ranged from 1 per cent to 4½ per cent, and time money, which could not be borrowed at 6½ per cent a fortnight ago, was offered at 5½ per cent. Brought about by these easier financial conditions, an increased buying for investment by the public as well as by professional traders was noticeable in the New York exchange. The bond market underwent a quickening impulse and advances from 1 to 5 points were general. Steel and industrial stocks responded to the buoyant influence in the market, and with almost no exception, net gains in prices were shown. Many of these were of sharp proportions. While the general rally of the market was strong, yet the recovery of prices amounts to only about one-third of the entire decline which has been experienced since last December. The weekly bank statement showed an increase of $6,309,950 in surplus reserve, an increase of $6,143,600 in loans. Trading on the New York exchange amounted to 6,246,400 shares, as against 5,922,850 shares last week and 5,250,400 shares the corresponding week in 1906. Sales of railway and miscellaneous bonds aggregated $14,670,000 as against $12,523,000 last week and $15,741,000 the same week of last year.

Financial Notes.

The J. G. Brill Co., of Philadelphia, has bought the outstanding $300,000 stock issue of the Wason Mfg. Co., of Springfield, Mass., for $1,200,000, to round out its consolidation of companies engaged in electric and steam car manufacture. The money required was furnished the Brill company through the sale of $1,270,000 of its new perferred stock.

Dividend and interest disbursements to be made during the month of April by railroad, industrial, traction, light, mining and other corporations will aggregate $137,048,205, of which amount the railroads will pay out $73,033,455 and miscellaneous companies $64,014,750 says the *New York Commercial*. These will constitute the largest payments on record for April.

Recent dividend declarations include the Montreal Steel Works, Ltd., regular quarterly dividend of 1¾ per cent on its preferred stock, payable April 8; Bethlehem Steel preferred, regular quarterly dividend of 1¾ per cent, payable in May; Westinghouse Electric & Mfg. Co., quarterly dividend of 2½ per cent on its preferred assenting and non-assenting stock, payable April 10; La Belle Iron Works, regular quarterly dividend of 2 per cent; the March-Brownback Stove Co. increased its dividend from 4 to 4½ per cent.

THE LEADING INDUSTRIAL SECURITIES.

	Closing Quo. Apr. 6	Changes In Week	Date 1907 Ann. Meet.	Stock Outstanding	Dividend Basis	Dividend Being Paid	Dividend Date Last Div. Pay.
Allis-Chalmers	12⅞	+ ⅝	Sept.	19,820,000		.....	.....
Allis-Chalmers pr	34½	+6⅛		16,150,000	7 cum	.....	Feb., 1904
American Can	6	− ⅛	Feb.	41,233,300		.....	.....
Am. Can pr	54⅜	+3⅞		41,233,300	7 cum	5 Q.	Apr., 1907
Am. Car and Fdy	37⅝	+2⅝	June 27	30,000,000		2 Q.	Apr., 1907
Am. Car and Fdy pr	99	+1		30,000,000	7 n. c.	7 Q.	Apr., 1907
American Loc	66	+4	Oct. 5	25,000,000		1¾	Feb., 1907
American Loc. pr	110	+7		24,100,000	7 cum	7 Q.	Jan., 1907
American Ship	70	− ⅛	Oct. 2	7,600,000	6	1 Q.	Mar. 1907
American Ship. pr	107	−1		7,900,000	7 n. c.	1¾ Q.	Jan. 1907
Am. Steel Foundries	83¾	+1⅛	Oct. 1	15,810,000		.....	.....
Am. Steel Foundries pr	30½	+3½		17,240,000	6 cum	.....	Aug., 1904
Barney & Smith	72	+1	June 4	2,000,000	4	4	Mar., 1907
Barney & Smith pr	140	+5		2,500,000	8 cum	8 Q.	Mar., 1907
Bethlehem Steel	12	− ⅛	April 2	14,862,000		.....	.....
Bethlehem Steel pr	49	.....		14,908,000	7 n. c.	5 Q.	Feb., 1907
Cambria Steel	53⅜	+3⅛	Mar. 19	45,000,000*	6	3 Q.	Feb., 1907
Cambria Iron	47	.....		8,468,000*	4	4 S. A.	Apr., 1907
Chicago Pneumatic Tool	45	.....	Feb. 18	6,145,800	4	4 Q.	Jan., 1907
Colorado Fuel	37	+2¼	Oct. 21	30,132,000		.....	Apr., 1902
Crucible Steel	93⅝	+ ⅝	Oct. 16	24,578,400		.....	.....
Crucible Steel pr	73½	+2¾		24,430,500	7 cum	6	Mar., 1907
Empire Steel	8½	+ ½	Feb. 27	2,281,400		.....	.....
Empire Steel pr	49	.....		2,500,000	6 cum	3 S. A.	July, 1906
Fay & Egan	95	.....	Feb. 19	1,000,000	6	7 Q.	Feb., 1907
Fay & Egan pr	128½	.....		1,000,000	7 cum	7 Q.	Feb., 1907
General Electric	149	+4	May 14	63,643,600	8	8 Q.	Jan., 1907
Harbison-Walker	10	.....	Jan. 21	18,000,000	6	.....	.....
Harbison-Walker pr	74	+½		9,600,000	6 cum	6 Q.	Jan., 1907
International Pump	30	+3	June 4	17,762,500		2	Apr., 1905
International Pump pr	79¾	+3⅜		11,350,000	6 cum	6 Q.	Feb., 1907
Lackawanna Steel	45	−5	Mar. 13	34,971,400		.....	.....
Lake Sup. Corp	8	.....	Oct. 2	40,000,000		.....	.....
New York Air Brake	117½	+6⅝	June 18	10,000,000	8	8 Q.	Jan., 1907
Niles-Bement-Pond	130	.....	Feb. 6	5,000,000	6	6 Q.	Mar, 1907
Niles-Bement-Pond pr	105	.....		2,000,000	6 cum	6 Q.	Feb., 1907
Otis Elevator Co	38	.....	March 18	6,350,300		2 A.	Apr., 1907
Otis Elevator Co. pr	89	+4		6,308,500	6 n. c.	6 Q.	Jan., 1907
Penn. Steel	65	.....	May 13	10,750,000		.....	.....
Penn. Steel pr	99	.....		16,500,000	7 n. c.	7 S. A.	Apr., 1906
Pittsburg Coal Co	12¾	− ⅜	Feb. 11	32,000,000		.....	Nov.
Pittsburg Coal pr	55	+4		32,000,000	7	.....	Apr., 1905
Pressed Stl Car	38¼	+3½	Feb. 20	12,500,000		3	Aug., 1904
Pressed Stl. Car pr	94	+3		12,500,000	7 n. c.	7 Q.	Feb. 1907
Pullman	170	+10	Oct. 17	100,000,000	8	8 Q.	Feb., 1907
Railway Stl. Spring	46½	+2⅜	Mar 7	13,500,000		4 S. A.	Mar., 1907
Railway Stl Spring pr	92	+2		13,500,000	7 cum	7 Q.	Mar. 1907
Rep. Iron & Steel	30	+5	Oct. 9	27,191,000		.....	.....
Rep. Iron & Steel pr	87	+4¾		20,416,900	7 cum	7 Q.	Apr., 1907
Sloss-Sheffield	55½	+2	Mar. 5	10,000,000	5	5 Q.	Oct., 1906
Sloss-Sheffield pr	100	.....		6,700,000	7 n. c.	7 Q.	Apr., 1907
Tenn. Coal & Iron	144½	+4½	May 7	22,553,060	4	4 Q.	Feb., 1907
U. S. Pipe & Fdy	37¾	+2¾	June 26	12,500,000	4	4 Q.	Dec., 1906
U. S. Pipe & Fdy. pr	81	+5		12,500,000	7 n. c.	7 Q.	Dec., 1906
U. S. Steel	37¾	+2⅛	April 15	508,302,500	2 n. c.	½ Q.	Mar., 1907
U. S. Steel pr	100¾	+2⅞		360,281,100	7 cum	7 Q.	Feb., 1907
U. S. Steel 5's	98¾	+2¾		463,798,000	5	5 A.	.....
Va. Iron, Coal & Coke	74	+9¾	Sept. 17	8,641,600		.....	.....
Westinghouse Elec	147½	+ ½	July 24	24,998,700*	10	10 Q.	Apr., 1907
West'ghouse Air Brake	145	− ⅛	Oct. 1	11,000,000*		22½ Q.	Jan. 1907

Par value of shares, $100, except those starred, $50.

NEWS FROM MANY INDUSTRIES.

New Buyers:—

The Union Foundry Co., Anniston, Ala., has been organized with a capitalization of $100,000 by H. O. Salzer and others.

The E. G. Whitacre Boiler Co., Wellsville, O., has been organized with a capitalization of $30,000 by Edward G. Whitacre and others.

The Joliet Iron Products Co., Joliet, Ill., has been organized with a capital of $200,000 by J. J. Gaskell, D. H. Lentz and C. E. Woodruff.

The Standard Galvanizing Co., Pittsburg, has been incorporated by J. R. Atwell, Bellevue; J. W. Clark, Beaver, and W. R. Bruce, Allegheny.

The Globe Malleable Iron Co., Syracuse, N Y,. has increased its capital stock from $50,000 to $100,000 to provide for extensions and improvements.

Fritz Steel & Co., Chicago, Ill., have been incorporated with a capital of $125,000 by August H. Huelster, Leonard R. Steel and Albert S. Louer.

The De Graff Steel Post Co., De Graff, Logan county, O., has been chartered with an authorized capital of $5,000 by Henry C. Thatcher and others.

The Greenpoint Iron Works, Brooklyn, N. Y., has been organized with a capitalization of $5,000 by Norbert Schattner, Brooklyn; C. Romm and Harry Stein, New York.

The Standard Briquetting Machine Co., Pittsburg, Pa., has been incorporated to manufacture and deal in all kinds of machinery and implements with a capitalization of $250,000.

The American Ship Building Co., Buffalo, N. Y., has been organized by G. W. Maytham, F. C. Deming, R. J. McKee, Adam Cornelius, J. J. Boland, F. C. Brunke and H. O. Kingham.

The Kennett Implement Co., Kennett Square, Montgomery county, Pa., has been organized to manufacture agricultural implements. Dr. A. W. Gregg is president.

The Miller Non-Corrosive Metal Co., Pittsburg, has been organized with a capital of $50,000 by F. L. O. Wadsworth, Sewickley; W. Morse, Pittsburg, and L. Hays Gott, Allegheny.

The Christie Iron Works, 519 East Eighteenth street, New York, has been chartered with an authorized capital stock of $30,000 by MacDonald De Witt, J. T. Sturdevant and E. A. Freshman.

The Nugent Tool Co., Cincinnati, has been chartered to manufacture a patented clutch for power transmission. R. Brink Tyler, of Chicago, is president, and Richard C. Nugent, general manager.

The Irving Iron Works Co., Queens, N. Y., has been organized with an authorized capital of $50,000 by W. E. Irving, of Glenbrook, Conn.; G. A. Keller, of New York, and W. V. Wilson, of Flushing, N. Y.

The Schuylkill Haven Iron & Steel Co., Schuylkill Haven, Pa., has been chartered with a capital of $50,000 by George A. Maene, John W. Russel and Elbert Williamson, all of Philadelphia.

The Bushkill-Delaware Bridge Co., Trenton, N. J., has been chartered to build bridges with a capitalization of $50,000. The incorporators are: J. B. R. Smith, E. M. Applegate and Frank Transue.

The Empire Foundry Co., New Brunswick, N. J., has been organized to deal in foundry products with a capital of $125,000. The incorporators are: Charles F. Hickey, William C. Herbert and Addison C. Ornsdee.

The Ramsey Machine & Elevator Co., St. Louis, Mo., has been organized with a capitalization of $10,000 to manufacture and deal in machinery, elevators, tools, etc., by William Ramsey, George A. Ramsey and F. Ramsey.

The Eagle Machinery & Mfg. Co., Chicago, has been incorporated to manufacture machinery and patented novelties. The capital stock of the company is $5,000, and the incorporators are: K. Blgornecki, William Kustra and others.

J. M. and G. F. McCandless, of Paducah, Ky., and J. B. Bartee, of Memphis, Tenn., have incorporated the Tennessee Kaolin Iron & Timber Co., Paducah, Ky., with a capital stock of $200,000 for the purpose of developing mining and timber properties.

The Taylor-Batchelor Trading Co., Brooklyn, N. Y., has been organized to manufacture articles made of iron and other materials. The capital stock of the company is $250,000, and the incorporators are: Charles Batchelor, Rosana Batchelor, Zachary Taylor and William E. Taylor, all of the above address.

The National Machinery & Contracting Co., New Orleans, La., has been formed to do a general machinery and contracting business with offices at 416 Carondelet street. The officers are: Edwin H. Rousseau, president; A. Sperling, secretary-treasurer; George H. Magnien, manager, and Charles B. de Lamarre, chemist.

The Universal Co., of Hartford, Conn., has filed a certificate of incorporation for the purpose of dealing in metals and machinery. The capital is $10,000, and the incorporators are: R. Hakewessell, of Hartford; Charles Phelps and George E. Sykes, of Rockville, C. E. Bond and C. J. Roach, of Hartford, and C. M. Spencer, of Windsor.

The Brooklyn Forge & Supply Co., Brooklyn, N. Y., has been incorporated to manufacture machinery tools, engines, etc. The capital stock of the company is $10,000, and the incorporators are: George L. Gillon, 27 Cortlandt street, New York; George W. McLary and Lewis McDougall, 21 Franklin street, Brooklyn.

The Burrow Mfg. Co., Garfield avenue and Grand street, Jersey City, N. J., has been chartered with a capitalization of $250,000 to manufacture steam specialties by Charles N. Hart, 84 Halstead street, East Orange; August Kuhnla, Sunnyside avenue and Berbey street, Brooklyn, and Henry C. Eckenroth, 94 Jerome street, Brooklyn.

The Filley Automatic Railway Signal Co., Detroit, Mich., has been chartered with an authorized capital stock of $125,000 by Nathan G. Nash, Montpelier, O.; William S. Filley, Toledo, O.; Albert E. Wilson, Seneca C. Wilson, John H. Wagner, Charles H. Walker and others.

New Construction:—

The Grey Iron Foundry Co., Reading, Pa., is planning to erect an extension to its foundry.

The Kerrihard Co., Red Oak, Ia., has begun the erection of a machine shop 33 x 110 feet, two stories high.

The Cincinnati Shaper Co., Cincinnati, has prepared plans for a machine shop addition, 92 x 100 feet, two stories high.

The Standard Coupler Co., Bridgeport, Conn., has awarded the contract for a brick factory addition, 40 x 60 feet, two stories.

The Buffalo Scale Co., Buffalo, N. Y., has just completed work on an addition to its foundry plant which will increase the operating capacity 25 per cent.

The Trenton Iron Works, Trenton, N. J., has had plans prepared for two large brick additions, one story high.

One will measure 68 x 130 feet, the other 65 x 90 feet.

The National India Rubber Co., Bristol, R. I., has awarded the contract for a brick insulated wire mill, two stories, 62 x 452 feet. The electric generating plant will be enlarged.

The Narraganset Machine Co., Pawtucket, R. I., has awarded the contract for the erection of a brick factory addition 60 x 140 feet, to be used for the manufacture of steel lockers.

The Manufacturers' Foundry Co., Sandusky, O., is preparing plans for the erection of two foundry buildings of concrete construction, one story, 102 x 105 feet and 75 x 150 feet.

The new buildings which the National Machinery Co., Tiffin, O., will erect will be a new office and stock room. Additional equipment required for the machine department has been purchased.

The Maryland Car Wheel Works, Curtis Bay, Md., near Baltimore, which recently suffered a heavy damage from fire, is at work clearing the site preparatory to the erection of new buildings.

The Galion Iron Works Co., Galion, O., has staked off a site preparatory to building a new plant, 60 x 200 feet, one story, in that city. H. A. Pounder, L. M. Liggett and D. C. Boyd are on the building committee.

The American Brake Shoe & Foundry Co., Chattanooga, Tenn., is preparing plans for the erection of a plant on a site recently acquired in that city. The main building will be 150 x 300 feet.

The Union Steam Pump Co., Battlecreek, Mich., is now completing plans for extensive additions to the present plant. A new power plant complete and a large addition to the present machine shops will be constructed.

The Wetherill Castings Co., Philadelphia, is planning the erection of a new plant in that city. The building, which will occupy a tract of 10 acres, will include offices, machine shop, foundry, shipping department, warehouses, etc.

The foundry which the Olds Gas Power Co., Lansing, Mich., is to erect will be 135 x 300 feet. One wing only, 100 x 135 feet, is to be built at the present time. In addition, other extensions to the present plant are now in contemplation.

J. F. Dacey & Son, proprietors of the Gogebic Steam Pump Works, Duluth, Minn., are planning to erect an addition to their foundry, 80 x 100 feet, to be equipped throughout with electrically operated machinery. It is expected that the new foundry will be in operation by Sept. 1.

The Stanley Works Co., New Britain, Conn., manufacturer of iron butts, bolts and hinges, is planning the erection of three additions. Two additional stories will be constructed on the present three-story building, 40 x 200 feet. A five-story brick building, 40 x 42 feet, and a one-story steel frame structure will also be built.

The Christy Steel Co., Akron, recently organized, has broken ground for a new foundry, 80 x 130 feet. The equipment has been acquired and it is expected that operations will be started by July 1. The company will manufacture crucible steel castings and the output will be from three to five tons in the start, which will be gradually increased.

The Union Refrigerator Transit Co., Milwaukee, Wis., is constructing a car shop in Williamsburg, near that city, for making its general repairs. An erecting shop, 82 x 200 feet, and a mill and machine shop, 45 x 250 feet, are in process of construction. The buildings will be of brick and strictly fire proof. The company will ulimately have three miles of switching tracks.

Plans are being drawn by the Union Switch & Signal Co., at Swissvale, near Pittsburg, for a new foundry building, a blacksmith shop and power house. When these structures are completed, the company will have 140,000 additional square feet of floor space for manufacturing purposes. The business of the company increased 70 per cent last year over the previous year, and from present indications the business will approximate $10,000,000 this year.

The Seattle Car Mfg. Co., Seattle, Wash., has begun work at Renton, Wash., on a site of 155 acres on the construction of a plant for the manufacture of freight and passenger cars. There will be nine buildings, including a truck shop, 175 x 200 feet, erecting shop, 100 x 250 feet, foundry, blacksmith shops, wood shop, paint shop, offices and power house. The officers of the company are: William Pigott, president; O. D. Colvin, vice president and manager, and T. G. Haywood, secretary.

The Lunkenheimer Co., Cincinnati, has purchased the former factory of the Cincinnati Screw & Tap Co. in addition to two acres adjoining, and this will be occupied by a new company to manufacture pressed steel windows and door frames for office buildings invented by Edwin Lunken, president of the Lunkenheimer Co. It is also announced that the Lunkenheimer Co. is about to let the contract for an immense concrete building adjoining the present plant. Plans call for a structure, 100 x 300 feet, five stories, and this will be used in the manufacture of engineering specialties, principally valves.

The Raquette Foundry & Supply Co., Potsdam, N. Y., is now erecting a foundry, 53 x 99 feet, and a machine shop, 58 x 116 feet, of brick and steel construction at Massena, N. Y., which will be completed July 1. When the plant is erected, the company will remove from Potsdam to Massena, and will conduct a jobbing foundry and machine shop for the manufacture of special machinery of all kinds and of castings in gray iron, semi-steel, brass, bronze and aluminum. Among the equipment required will be two five-ton hand power traveling cranes, two 20 horsepower electric motors, some scales and possibly a new cupola and blower.

The Cincinnati Planer Co., Cincinnati, has broken ground for its new plant at Oakley, a suburb of Cincinnati, on an eight-acre site. The first building be of brick and steel construction, 140 x 200 feet, to be equipped with new machinery and operated as an addition to the present plant, the idea being to build all the larger sizes in this new plant. A second building 40 x 200 feet will be constructed as soon as the first building is completed and in operation, after which the entire plant will be removed to the new location. Several other well known manufacturers are also located in the same vicinity, the Cincinnti Milling Machine Co., the Bickford Drill & Machine Co., and the Triumph Electric Co. A central power company owned by these four concerns will furnish heat, light and power to the several plants.

General Industrial Notes:—

The Savill-Chandler Co., Canton, Ill., has increased its directory board from three to five members and it now includes Samuel Savill, C. B. Chandler, W. D. Plattenburg, W. J. Spencer and Lewis Thompson.

The Ross Stamping Co., Elyria, O., recently organized, reports that it will manufacture steel stampings for agricultural implements and all kinds of steel stampings and pressings. The chief output of the concern will be an all-steel shovel, patented by J. C. Ross.

F. W. Arnold and E. P. Yates have purchased control of the New Birmingham Pipe Works at New Birmingham, Tex. The deal includes the plant, iron ore mines, timber land and a hotel. The furnace and pipe works are to be overhauled and various extensions are to be made.

The Johnson Mfg. Co., New Haven, Conn., recently incorporated, states that it intends to manufacture specialties, principally of sheet metal. The shop equipment will consist of drawing, punching and stamping presses, a line of general shop machine tools and plating plant. No building will be done at present.

The Kilby Frog & Switch Co., Birmingham, Ala., has consolidated with the Alabama Frog & Switch Co. The concern will be known as the Kilby Frog & Switch Co. with W. W. Stringfellow as president, Thomas E. Kilby, vice president; Whitfield Clark, secretary and treasurer, and E. M. Kilby, general manager.

The Ravenna Heating & Furnace Co., Ravenna, O., has been reorganized and the following new officers elected: President, F. C. Park; vice president, John F. Babcock; secretary, and treasurer, W. A. Hammond. The board of directors consists of these officers and A. V. Davidson, Pryor Frank, A. Dietrich and H. R. Loomis.

H. E. Elrod, formerly general manager of the Bartlett Steel Co., Joplin, Mo., is promoting a new iron and steel plant to be erected at Houston, Tex. A site of four acres has been purchased and a modern plant will be erected at once. The product of the concern will be fire escapes, ornamental iron work and similar devices.

The Sweet Steel Co., Williamsport, Pa., has been reorganized by the election of Robert Ahlis, of Easton, Pa., as president; W. L. Wright, of Philadelphia, vice president; H. L. Stevens, treasurer, and F. M. Sears, secretary. Messrs. Ahlis and Wright in conjunction with Philip S. Dyer, of Easton, and J. W. Rawle, of Philadelphia, recently purchased controlling interest in the company.

The Bucyrus Steel Castings Co., Bucyrus, O., which made its first heat March 13, is now operating a 25-ton furnace with a capacity of 75 to 100 tons daily. The company has in use four Niles cranes, one of 35, one of 20 and two of 10-ton capacity, respectively. To celebrate the beginning of operations at the plant a banquet was given by the employes of the company at the Hotel Royal, Bucyrus, March 16, which was attended by the officers of the concern. The menu cards were cleverly arranged in the vernacular of a steel plant. The erection of the plant at Bucyrus has given the city quite an industrial impetus.

Trade Notes:—

The A. B. Farquhar Co., York, Pa., has just completed the shipment of several carloads of traction engines and farm machinery to Mexican plantations.

Pressing business requirements have compelled the Presbrey Fire Brick Works, Taunton, Mass., to erect in addition to large store-house facilities, a two-story building, 30 x 80 feet, alongside its spur track from which carload shipments are dispatched, thus insuring prompt delivery.

G. F. Ehrenzeller, Philadelphia, has removed his main office from New York to the Pennsylvania building, Fifteenth and Chestnut streets, Philadelphia. Mr. Ehrenzeller will continue to represent Messrs. Beer, Sondheimer & Co., of Frankfurt and London, and will fill requirements for pig iron, ferro-manganese, spiegeleisen, ores, metals and all descriptions of ferro-alloys and other raw material.

S. D. Lieberman, formerly with the Pittsburg office of L. K. Hirsch & Co., dealers in relaying rails, iron and steel scrap, has established an office at 1020 First National Bank building, Chicago, where he will conduct a business, under the name S. D. Lieberman Co., buying and selling steel rails, billets, metals, iron and steel scrap, etc. Storage yards have been opened at 39-43 North Halstead street, Chicago.

The Hammond-Byrd Co., dealer in pig iron, coke and coal, 1416-1419 Brown Marx building, Birmingham, Ala., has been appointed exclusive agent for the sale of the Shelby charcoal car wheel iron manufactured by the Shelby Iron Co., Shelby, Ala. This firm is also an exclusive agent for the Imperial warm blast foundry coke iron in addition to handling other brands of high grade southern foundry iron as well as foundry coke.

The Hill & Griffith Co., Cincinnati, has recently taken the western selling agency for the line of portable snap molders' benches manufactured by the Stockholm Homogeneous Mixer Mfg. Co., and also for the metallic core bent manufactured by the Metallic Core Bent Mfg. Co., Buffalo, N. Y. The construction work on the new plant of the company is being pushed, and the buildings will be completed and occupied by June 1.

The Chicago branch of the Niles-Bement-Pond Co., manufacturer of machine tools, will occupy new offices on the sixth floor of the new Commercial National Bank building, Clark and Adams streets, May 1. In this building will also be located many large engineering and steel companies. The Pratt & Whitney Co. will abandon its show room and offices at 46-48 South Canal street, and will combine its machinery sales department with that of the Niles-Bement-Pond Co. The show room and stock of the Pratt & Whitney small tools and small tools sales department will be located on the ground floor of the new Plamondon building, Clinton and Monroe streets, where a complete line of Pratt & Whitney small tools and gages will be carried in stock. George F. Mills, who has for several years looked after the interests of these companies in the Chicago territory, will continue as manager of the Chicago office.

The Vorce Engineering Co. announces the opening of its general offices in the Perry-Payne building, Cleveland. The company will attend to the designing and supervising of various structures, to industrial and architectural engineering, railway surveying, power plants and municipal engineering. Myron B. Vorce, formerly inspector of building for Cleveland, is president and general manager of the company.

Fires:—

The boiler plant of Hibbin & Co., Chicago, was destroyed by fire March 30.

The Bayside Iron Works, Everett, Wash., was destroyed by fire March 23, causing a loss of $25,000.

The plant of the Magnolia Stove Works, Memphis, Tenn., was damaged by fire to the extent of about $50,000 March 29.

Fire which originated in the boiler room of the John H. Murphy Boiler Works, New Orleans, La., caused a loss of $12,000 March 28.

The explosion of a furnace caused a fire at the plant of the St. Paul Foundry Co., St. Paul, Minn., recently. The damage is estimated at $10,000.

The foundry of the J. K. Williams Foundry & Machine Co., Akron, O., was destroyed by fire March 12. Insurance is ample. The machine shop was not damaged. It is stated that the work of erecting a substantial brick structure to replace the one destroyed will begin at once. The fire was the third one that has occurred at the Williams' foundry within four years.

The Youngstown Sheet & Tube Co., Youngstown, has let a contract for a new butt-weld furnace, which will increase the company's total to three. The contract calls for the completion of the furnace by July 1. The new 16-inch skelp mill at the Youngstown plant will be ready about May 1.